

## EUPHORBIAE NOVO-GALICIANAE REVISAE

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More than 30 years ago I published an account (Brittonia 13: 167–187. 1961) of what I knew about the genus *Euphorbia*, at that time including *Chamaesyce*, from the part of western Mexico that is covered by the *Flora Novo-Galiciana*. Many new specimens have been collected since 1960, resulting in numerous range-extensions, and reports of species new to the area. The availability of more material for study, and recent revisionary papers by other authors, have made it possible – and necessary – to reconsider the taxonomy of some species-groups, and to describe what appear to be several taxa new to science. Data on some individual species are presented below essentially in the form of treatments in the Flora, with concentration on the same area. A map of Nueva Galicia, and an index to localities, may be found in *Flora Novo-Galiciana*, volume 17, pp. 436–453. 1992. For the privilege of large loans of herbarium material I am indebted to the curators and staffs at F, GH, MICH, MO, TEX, and US. Special favors of loans and information about types and other specimens at BM, HAL, and L were kindly provided by Roy Vickery, F. R. Barrie, Klaus Werner, and J. F. Veldkamp. Michael J. Huft has been especially kind in providing suggestions, information, and specimens relevant to this study.

As a belated apology to Sereno Watson, it should be noted that at least two of the new names that I published in 1961 were superfluous. My outlook at that time was even more provincial than it is now, and I neglected to look carefully enough to the north and east beyond the boundaries of Nueva Galicia, in order to match what I took to be novelties. In 1886 Watson (Proc. Amer. Acad. 21: 455) published the name *Euphorbia lineata*, based on *Pringle 187*, GH!, from borders of warm springs near Chihuahua. The plant has since been renamed *Chamaesyce lineata* (S. Wats.) Millsp. (Field Mus. Publ. Bot. 2: 410. 1916). It transpires that the same species occurs at widely scattered localities, always in wet places, south along the mountains to Durango and to Jalisco, whence I described it in 1961 as *Euphorbia paludicola* (Brittonia 13: 184). In 1891 (Proc. Amer. Acad. 26: 146) Watson proposed another new species, *Euphorbia misella*, from the State of Mexico, based on *Pringle 3305*, GH! This inconspicuous little plant, moderately widespread but scattered across central Mexico, and still little known, I redescribed as *Euphorbia biuncialis* (Brittonia 13: 172. 1961).

### A BIBLIOGRAPHICAL NOTE ON THE *TRICOCCAE* OF KLOTZSCH & GARCKE

Modern students of the Euphorbiaceae often have occasion to refer to a paper by Klotzsch & Garcke, which consists primarily of a synopsis of the modern tribe *Euphorbieae*, or in a broad sense the genera *Chamaesyce*, *Euphorbia*, and *Pedilanthus*. Its importance today depends on the fact that the authors studied the

entire group. They recognized 18 genera of which they described 12 as new. They proposed almost exactly 100 new species and created several hundred additional new names and new combinations at the specific level. Several of their generic proposals have been accepted by subsequent authors. The newly proposed species, all or nearly all based on specimens in the Berlin Herbarium, are from all parts of the world, a majority of them from tropical America. At least 10 from Mexico are based on the collections of Carl Ehrenberg, a few on those of Schiede and Aschenborn.

An abridged version of the work was published in the report of the meeting of the Berlin Academy of Sciences of March 10, 1859, with the title, "Hr. Klotzsch las über Linné's natürliche Pflanzenklasse *Tricoccae* des Berliner Herbarium's im Allgemeinen und die natürliche Ordnung *Euphorbiaceae* insbesondere." (Monatsberichte Königl. Preuss. Akad. Wiss. Berlin 1859: 236–254. 1859 ["1860"]). Though the title-page of the volume bears the date 1860, the contribution by Klotzsch was noted as having been received in *Flora* for 7 Sep 1859.

In this preliminary version the author (Johann Friedrich Klotzsch) notes that he has undertaken the revision of the *Euphorbieae* in collaboration (*Gemeinschaft*) with his friend and colleague Herr Dr. [Christian August Friedrich] Garcke. All the new names published in this paper and in the later, more complete version, are attributed to "Kl. et Gke." and in later publications are properly attributed to both authors. The recent *Index Nominum Genericorum* cites them with nomenclatorial pedanticism as "Klotzsch et Garcke in Klotzsch," and Oudejans (1990) as "Klotzsch & Garcke ex [J.] F. Klotzsch," though it may be argued that in a collaborative project the "in [or ex] Klotzsch" is unnecessary. The first half of the paper is devoted to a historical summary and to general taxonomic considerations of the Euphorbiaceae and related families. The second half includes descriptions of the newly proposed genera (*Trichosterigma*, p. 248; *Eumecanthus*, 248; *Tithymalopsis*, 249; *Dichrophyllum*, 249; *Leptopus*, 249; *Adenopetalum*, 250; *Medusea*, 251; *Arthrothamnus*, 251; *Sterigmanthe*, 252; *Euphorbiastrum*, 252; *Hexadenia*, 253; *Diadenaria*, 254) with summary comments on their geographical ranges and the number and names of the included species. One new species, *Euphorbiastrum hoffmannianum*, is proposed with a combined generico-specific description. In some genera, e.g., *Arthrothamnus*, *Eumecanthus*, *Medusea*, *Pedilanthus*, *Poinsettia*, some new combinations are validated by brief citations of the basionyms, but in most genera, as in *Adenopetalum*, the authors merely state, "Hierher gehören," followed by a list of binomials under *Euphorbia*, and a list of the names, without formal combinations or descriptions, of proposed new species of *Adenopetalum*. Many new combinations that were not in fact made at this time, but in 1860, are listed by Oudejans (1990) as if validly published in this 1859 article in the Monatsbericht. Stafleu & Cowan (Tax. Lit. ed. 2: 2: 571. 1979) cite two uncolored plates by C. F. Schmidt, pl. 1–2, accompanying the text of this 1859 paper. A reprint from the 1859 paper exists in the Stanford University collection of Adolf Engler's reprints, now at the California Academy of Sciences. It was reprinted on thick paper with the original pagination, pages 236–254, without change except for the deletion of the page-number on page 236, the deletion of the introductory material at the top of the same page, and the addition of a new title-page (recto, verso blank). Plates 1 and 2, by Schmidt, the only numbered plates in the volume of the *Monatsberichte* for 1859, accompanied a more ambitious paper by Klotzsch, on Aristolochiaceae, pp. 571–626, in the same volume, and were correctly so reported by Stafleu & Cowan. Evidently the citation of the same plates with the paper on *Tricoccae* was a gratuitous addition.

The more complete version of the *Tricoccae*, with descriptions of newly proposed species, and full documentation for all new names and new combinations, was published the next year with the same title, beginning "Linné's natürliche Pflanzenklasse *Tricoccae*" (Abhandl. Königl. Akad. Wiss. Berlin 1859 [Phys. Abhandl.]: 1-108. 1860). The *Physikalische Abhandlungen* do not constitute a separate series, but are included in the general volume along with the mathematical and philological/historical contributions, each of the three with its own pagination. The *Tricoccae* was again reprinted as a separate, apparently without any modifications except for the preparation of a new title-page (recto and verso) and changes in the first page that do not affect the text. Stafleu & Cowan (loc. cit.) mention the reprint and again cite "pl. 1-2 (uncol. liths. by Franz Wagner)." In the copy of this volume of the *Abhandlungen* in the University of North Carolina library I find no mention of any such illustrations. My copy of the reprint lacks the plates. Ms. Bernadette Callery, Research Librarian at the New York Botanical Garden, kindly reports that neither of two copies of the reprint in that library includes the plates. In a copy at the Missouri Botanical Garden, however, which was sent to George Engelmann by A. Braun, as mentioned by Stafleu & Cowan, there are two such plates done by Franz Wagner. The Curator of Botanical Literature at the Garden, Ms. Linda L. Oestry, very helpfully informs me that the plates appear to have been tipped in, after some cropping, when the volume was bound. The plates are quite irrelevant to the text, representing two African species described by Klotzsch in Peters' *Reise nach Mossambique*, vol. 6, *Botanik*, in 1861, viz. *Cephalocroton mollis* (Peters, p. 99, pl. 17), and *Calyptrospatha pubiflora* (p. 97, pl. 18). Both species are euphorbiaceous, but not members of groups treated in detail in the *Tricoccae*. It may be surmised that the plates were bound in inadvertently, having been included by Braun with the reprint sent to Engelmann, or sent separately to Engelmann soon afterward.

For nomenclatural purposes the shorter article in the *Monatsbericht* has priority over the fuller account in the *Abhandlungen*. This affects the new generic names published by Klotzsch & Garcke, and the few new combinations under *Poinsettia* and other genera, but relatively few other names. Most of the new names proposed by these authors date from some unspecified time in 1860. I have no information as to the exact date, nor as to whether the reprint was distributed before or after the text of the volume itself. It would be useful to know the earliest date at which either one was published, in view of possible nomenclatural conflicts with Boissier's *Centuria Euphorbiarum*, also published in 1860, perhaps in April. In this paper Boissier mentioned (without any documentation) several Klotzsch & Garcke names that did not appear in their 1859 paper, which suggests that either specimens with annotations by Klotzsch & Garcke, or the text of their 1860 work, must have been available to Boissier before April 1860. In Boissier's account of *Euphorbia* published two years later (in DC. Prodr. 15, part 2, 1862), he cited the Klotzsch & Garcke names, this time with the addition of the page-numbers from the 1860 publication.

#### CHAMAESYCE AND EUPHORBIA

Whatever the disposition of smaller natural groups within the heterogeneous assemblage that is *Euphorbia*, its very size and heterogeneity have made it unwieldy. Webster (1967), in a superb and objective review of generic limits in this and other groups of Euphorbiaceae, said, "The tremendous diversity in habit,

leaf morphology, chromosome number, and pollen configuration might at first appear to favor the dissolution of *Euphorbia* into a number of smaller genera. However, a review of the taxonomic history of the Euphorbieae is sufficient to indicate that the problem does not have an obvious solution... If the various microgenera of Euphorbieae cannot be easily distinguished, there seems little reason to adopt them simply because they represent evolutionary units; it is quite as easy to discuss the evolution of these taxa if they are referred to as infrageneric components of *Euphorbia*." Webster then concluded (pp. 397-398) that much further study of the basic cytological and morphological data will be needed before the taxonomic impasse can be resolved. His solution, *pro tem.*, was to accept a compromise view on generic limits, a "disposition... frankly one of expediency and... not [claiming] either logical or phylogenetic justification." The compromise was ["diffidently"] to accept *Chamaesyce* as a distinct genus and relegate all other segregate taxa, including *Poinsettia*, to subgeneric status within *Euphorbia*. "*Chamaesyce* happens to be a large and doubtless natural group of several hundred species which is rather easily definable. It seems more convenient, in practice, to recognize *Chamaesyce* as an independent genus than to retain it within *Euphorbia*."

Marshall C. Johnston (1975, pp. 137-138), in a spirited rebuttal of Webster's view, argued that in spite of the fact that *Chamaesyce* is rather easily definable, it is still a weak genus and there is no compelling evidence to justify its removal from its traditional place in *Euphorbia*. He went on to say that although some taxonomists will probably continue to recognize *Chamaesyce* at the generic level, "inasmuch as most lay and professional botanists still use an inclusive concept of *Euphorbia*, the recognition of *Chamaesyce* as a genus is a latent if not actual impediment to communication, and is therefore inadvisable. The use of a broad concept of *Euphorbia* reaffirms an appreciation of the often benign role of inertia in scientific communication."

Though for the *Flora Novo-Galiciana* I personally would prefer to maintain *Euphorbia* in the inclusive sense, and I fully agree with Johnston that the dismemberment of such a large traditional group may be for a time a troublesome impediment to communication, reason tells me that if I follow my own recommendations for segregation of genera, as set forth previously (Wrightia 1: 15-17, 1945), I have to accept the alternative classification: 1) *Chamaesyce* has some marked morphological distinctions, in the abortive stem-axis and sympodial branching, and in the always opposite and usually inaequilateral stipulate leaves with their unusual chlorenchyma-sheathed veins. In Mexico a very few species (to be retained in *Euphorbia*) seem to cross the line between the two taxa, but it may be that further study will resolve the difficulty. As Webster noted, "the difficulty in writing an unequivocal generic diagnosis of *Chamaesyce* is real, but not greater in actuality than for many other euphorbiaceous genera." 2) *Chamaesyce* is not an unfamiliar name; it has been accepted by various authors at different times, and most of the combinations at the specific level, at least for species in Nueva Galicia, are already available. 3) Homogeneity. *Chamaesyce* is a large and natural group of some 250 species. 4) *Chamaesyce* is not merely an element of a local flora, but is worldwide, though a majority of the species (at least three-fourths) are American. In the *Flora Novo-Galiciana*, dealing as it does with an area in which at least two-fifths of the approximately 75 species of *Euphorbia*, *sens. lat.*, belong to *Chamaesyce*, the separation between the two genera should be a convenience to users of the Flora, and perhaps will lead eventually to a better under-

standing of both taxa. *Chamaesyce* once accepted, the following new combinations are necessary, and the following newly discovered taxa are placed on record:

***Chamaesyce apatzingana*** (McVaugh) McVaugh, comb. nov. *Euphorbia apatzingana* McVaugh, Brittonia 13: 182. 1961.

***Chamaesyce feddema*** (McVaugh) McVaugh, comb. nov. *Euphorbia feddema* McVaugh, Brittonia 13: 183. 1961.

***Chamaesyce grammata*** McVaugh, sp. nov., ut videtur annua, prostrata, ramis petiolisque supra pubescentibus, subtus glabris; folia glabra (pilis paucis basalibus exceptis), ut videtur subcoriacea, opaca, laminis plerumque oblongo-ellipticis ubique uniformibus 5–9 mm longis, apice subserrulatis, basi inaequilateralibus; partes floriferae distales ramorum elongatae rectae, primo aspectu simplices, sed cyathii in fasciculis compositis axillaribus quoque nodo orientibus; involucrium (glandulis exclusis) ca 0.5 mm longum; involucri glandulae 4, terminales, manifeste stipitatae, rotundatae, diametro 0.15–0.3 mm, appendicibus angustissimis; flores ♂ ca 5; styli 0.5–0.7 mm longi, bifidi; gynophorum crassum, vix quam involucrium longius; capsula 1.2–1.3 mm diametro, trilobata, pilis brevibus corrugatis dense vestita, loborum pilis in cristis tribus longitudinalibus aggregatis; columella ca 1 mm longa; semina ovoideo-quadrangularia, 0.8–0.9 mm longa, subroseo-brunneola, angulis acutis, superficiebus lateralibus transverse profundeque 4 (–5)-sulcatis.

Known only from the type-collection, taken in a region of low hills sparsely wooded with *Cordia*, *Amphipterygium*, *Cercidium*, and *Caesalpinia platyloba*, elev. ca 275 m, in a pasture ca "1 mi" west of San Juan de los Plátanos, between San Juan and Santa Ana Amatlán, Mpio. Apatzingán, Michoacán, with flower and mature fruit 17 Sep 1958 (*McVaugh 17960*, MICH, the holotype).

Prostrate herb, annual or of indefinite duration, with few branches 5–10 (–18) cm long spreading from a vertical taproot; branches forking or unilaterally branched near base, with internodes there often 1 (–2) cm long, the distal portions of the branches all straight and very floriferous, with few–15 or more rather crowded floriferous nodes on a seemingly unbranched axis, the distal internodes 2–5 mm long; stems compressed, thin-edged at least distally, the upper side convex and crisp-pubescent, the lower side flat or nearly so, glabrous except for a sparse fringe of marginal hairs; stipules distinct, subulate, reddish, those on the upper side very narrow (like setae), hispidulous, 0.4–0.6 mm long, usually (at least at the upper nodes) with the base of an abortive peduncle between them; lower stipules only sparingly hispidulous, well separated and often divergent, ca 1 mm long and up to 0.5 mm wide at base; petioles ca 1 mm long, puberulent or pilose on the upper side; blades glabrous except for a few long hairs at base, apparently subcoriaceous, thick with thicker pale margins, opaque, the venation usually not discernible in dried specimens; blades nearly uniform in size throughout (or those at the distal nodes slightly smaller), oblong-elliptic or slightly wider at base or apex, 5–9 mm long, 1.5–3 (–4) mm wide, mostly about twice as long as wide, the apex blunt and weakly to obscurely serrulate, the base moderately to strongly inaequilateral, obtuse to truncate or hemicordate; cyathia very crowded at fertile nodes in compound axillary clusters up to half as long as the leaves, the clusters sessile but sometimes dispersed along an axis up to ca 1 cm long with 5–8 internodes 0.5–1 mm long and reduced green bracts; cyathia 1–6 in an individual cluster; peduncles ca 0.5–1 mm long; involucries pilose distally, ca 0.5 mm long exclusive of the

glands; lobes erect, triangular, about as long as the glands; glands 4, erect, manifestly slender-stalked, terminal, standing 0.3 mm high including the stalk, nearly round, red, cupped, 0.15–0.3 mm across, the appendage usually a narrow abaxial rim up to ca 0.1 mm wide, below the gland; ♂ flowers ca 5; styles 0.5–0.7 mm long, bifid about one-third their length; gynophore scarcely longer than the involucre, ca 0.75 mm long, disproportionately thick (ca 0.25 mm), pilose distally, usually strongly recurved about at the margin of the involucre; capsule subglobose, shallowly and roundly 3-lobed, 1.2–1.3 mm in diameter, densely vestite with short white upstanding crumpled multicellular hairs, the hairs on the lobes in contrasting longitudinal bands, those in the intervals shorter and less densely crowded; columella ca 1 mm long; seeds pinkish brown, ovoid-quadrangular with prominent angles, truncate at base, acute at apex, 0.8–0.9 mm long, the faces 0.4–0.5 mm wide; all faces with ca 4 (–5) deep transverse sulci narrowed at bottom to a line, the intervening ridges rounded, extending to small protuberances at the four angles.

The specimens of this species were originally identified as belonging to *Euphorbia* (*Chamaesyce*) *thymifolia*, which they superficially resemble because of the prostrate stems and the small leaves. In that species, however, at least in our area, the proximal pair of appendages to the glands are commonly somewhat enlarged, wider than the gland is long, and sometimes prolonged distally 0.4–0.7 mm beyond the gland. More fundamental differences are in the seeds, in the gynophore, and in the vestiture of the ovary and capsule. In *C. thymifolia* the seeds are marked by shallow and often irregular transverse concavities separated by subacute ridges, the gynophore is so short that the capsule is never fully exerted from the involucre, and the capsule is thin and evenly covered with straight or crisped hairs that do not obscure the surface.

***Chamaesyce linguiformis*** (McVaugh) McVaugh, comb. nov. *Euphorbia linguiformis* McVaugh, Brittonia 13: 184, figs. 16–18, 1961. Type, Michoacán, Apatzingán, Hinton 12014, MICH, holotype and isotype; US, isotype.

This species is unique among the Mexican species of *Chamaesyce* known to me, in having the involucreal glands oriented radially instead of transversely (tangentially). [The same orientation of the glands is reported in one rare species of the deserts of southern California and Arizona, *C. platysperma* (S. Wats.) Shinners, but in that species the seeds are strongly flattened and the glands are exappendiculate]. The relatively large cyathia of *C. linguiformis*, the elongate appendages, the large triangular-ovoid almost isodiametric but nearly unlobed capsule with truncate base, and the large quadrangular unornamented seeds also provide a distinctive combination of characters. I have seen nothing that precisely matches Hinton's original specimens of *Chamaesyce* (*Euphorbia*) *linguiformis*, which constitute the var. **linguiformis**. Though those were complete in the sense that all parts of the plant were present and could be described, they were brittle and broken and not easy to study.

Originally I failed to notice the unusual orientation of the involucreal glands, though they are clearly shown in the illustration in the protologue (Brittonia 13: 175, fig. 16, 1961). Thirty years later, when I came across specimens with radial orientation of the glands, it seemed at first that these represented an undescribed species from the lowlands of Michoacán. Later, when I compared the description of this plant with a complete new description of *C. linguiformis* based on re-examination of the type-material, I could find no single character in which they differed

significantly except that the leaf-blades in *C. linguiformis* are always entire as far as can be determined, and those of the newly collected material are serrulate. Subjectively, Hinton's specimens do not look as if they were conspecific with the others, but that is a matter of taxonomic prejudice, not of fact. The two taxa share a unique combination of so many features that the new material is here presented as representing a variety of *C. linguiformis*, and is treated in full to allow adequate comparison with var. **linguiformis**:

**Chamaesyce linguiformis** var. **actinadenia** McVaugh, var. nov., herba perennis, prostrata, omnino glabra, stipulis conspicuis plus minusve coalitis 1–1.5 mm longis, foliis brevipetiolatis, laminis oblongo-ovatis vel oblongo-ellipticis 5–6 (–10) mm longis serrulatis, cyathiiis in axillis vel furcis distalibus solitariis longe pedunculatis 1.5–2 mm longis, glandulis 4 radiatim elongatis, appendicibus linguiformibus; pedunculi 5–12 mm longi; involucri lobi rotundati, ca 0.5 mm longi, intus pilosi; glandulae terminales patelliformes, rotundatae vel latiores quam longiores, diametro 0.4–0.6 mm; appendices sub glandula ad angulum ca 90° patentes, niveae vel roseolae, 0.8–1.5 mm longae, 0.5–0.8 mm latae; flores ♂ ca 35–40; styli ca 1 mm longi, crassi, longitudinis dimidio bifidi, ramis capitatis; gynophorum 4–5.5 mm longum; capsula late ovoideo-triangularis, ca 3–3.5 mm longa lataque, basi truncata; columella 2.4–2.7 mm longa; semina 2–2.2 mm longa, grisea vel brunnea, oblongo-quadrangularia, laevia, basi truncata, superficiebus abaxialibus convexis 1–1.2 mm latis, adaxialibus subplanis 0.7 mm latis; a var. *linguiformi* foliis serrulatis differt.

Bare sandy Pacific beaches (the type collection) or "open grazed desert scrub," sea-level to 200 m as far as known, collected in early anthesis in July and with mature fruit in August.

Mich., Mpio. Aquila, "Playa Cocula about 44 miles SE of the Colima-Michoacán boundary on Route 200" (*R. L. Wilbur 36640*, MICH, the holotype); Mpio. Arteaga, valley of the Río Balsas, highway 37, "3.2 mi" S of La Vinata, "0.2 mi" S of Las Cañas (*W. W. Thomas 2935*, MICH). Otherwise unknown.

Perennial, glabrous and apparently glaucous, from a woody cylindrical root 15 cm long and 4–6 mm thick, the many slender prostrate branching stems 20–30 cm long from a crown bearing persistent stem-bases of a previous season; stems ca 0.5–1 mm thick near base, the internodes throughout the plant 10–40 mm long; leaves opposite; stipules united at least at base into a whitish triangular scale 1–1.5 mm long, with long-fringed tip and margins; petioles ca 0.5–1.5 mm long; blades oblong-ovate to oblong-elliptic, mostly 5–6 mm long and 2.5–4 mm wide, rounded abruptly to the petiole at base (at least in the larger leaves manifestly inaequilateral), rounded at apex, usually with a reddish streak near base adaxially on the midline, minutely (sometimes obscurely) serrulate on the distal half of the blade and sometimes nearly to the base especially on the longer side; cyathia solitary and long-pedunculate in the distal axils and forks, the peduncles 5–12 mm long, ca 0.25 mm thick; involucre funnelform or campanulate, usually acute at base, 1.5–2 mm long excluding the glands; lobes roundish, pale, ca 0.5 mm long and wide, with a few narrow teeth at apex, and hairy on the inner surface; glands 4, saucer-shaped, terminal and standing at approximately a right-angle to the long axis of the involucre, round or commonly elliptic, then with the longer axis radially oriented, the longer axis (width) 0.5–0.6 mm, the shorter axis (length) ca 0.4–0.5 mm; appendages linguiform, showy, white or pinkish, rounded at apex, entire, spreading widely from beneath the abaxial side of the gland, often curved upward

near the tips, 0.8–1.5 mm long, 0.5–0.8 mm wide; ♂ flowers ca 35–40; styles ca 1 mm long, stout, bifid about half their length, the branches capitate; ovary ovoid, subtruncate at base; gynophore 4–5.5 mm long, usually strongly recurved; capsule broadly ovoid-triangular, only obscurely 3-lobed, truncate at base, ca 3–3.5 mm long and wide; columella 2.4–2.7 mm long; seeds 2–2.2 mm long, smooth (without ornamentation), oblong-quadrangular, dull gray to brownish gray, truncate at base, obliquely obtuse at apex, keeled abaxially, the abaxial side more prominent and the faces convex, ca 1–1.2 mm wide; adaxial faces nearly flat, ca 0.7 mm wide with a strong median line between them.

The paratype specimen cited above consists of vegetatively vigorous young plants at an early stage of flowering, with most cyathia not yet fully developed, the appendages 1 mm long or less, but the glands showing clearly the radial orientation. The leaf-blades are somewhat larger than those of the type, up to 9–10 mm long and 5–6 mm wide, on petioles up to 2 mm long.

#### THE CASE OF *EUPHORBIA* (*CHAMAESYCE*) *DIOECA*

Kunth (in H. B. K. 2 [quarto]: 53, 1817) proposed the name *Euphorbia dioeca* for a specimen collected by Humboldt & Bonpland in Venezuela, "juxta Cura, alt. 226 hex. (Valles de Aragua)." He assumed the plant was dioecious, having found nothing but staminate flowers, and said of the specimen "Planta in statu vivo denuo examinanda," perhaps thinking that if living plants could be examined, the matter of the unisexual cyathia ("flowers" as he called them) could be investigated further. His description made it clear that the plant was a small prostrate pubescent species of *Chamaesyce* with two of the four glandular appendages larger than the others. Naturally enough he did not mention the seeds.

Since 1817 the name has been mentioned by various authors, mostly incidentally, usually with the spelling of the epithet changed to *dioica* (though there is considerable precedent for the other spelling, e.g., in the Class Dioecia of Linnaeus, and Kunth's spelling seems to have been intentional, as in his description he used the words *floribus dioecis*). Klotzsch & Garcke (1860, p. 31) made the combination *Anisophyllum dioicum*, stating at the same time that *Euphorbia multiflora*, no. 9291 of the Willdenow herbarium, was the same species. Boissier (in DC. Prodr. 15, part 2: 49, 1862) took up the name *Euphorbia adenoptera* Bertoloni, published in 1843, for an assemblage that included most of the American members of a complex of species having the glandular appendages in unequal pairs, as in *E. dioeca*. He implied that he had seen the original material of *E. dioeca*, as he wrote among his citations, "Venezuela (Humb. Bonpl.!), and he included the name *E. dioeca* ("*dioica*") in the synonymy of *E. adenoptera*. Presumably he discarded *dioeca*, the older epithet, because, as he wrote, "Nomen specificum Humboldtianum omnino improprium, involucrem enim omnia a me observata hermaphrodita." Boissier described the seed as "transverse et parallele 5–7-sulcato," but unhappily that description applies equally well to several members of the complex that have since been segregated.

C. F. Millspaugh (1914) was the first person to provide a convenient means of separation of *Chamaesyce dioeca* ("*dioica*") (H. B. K.) Millsp., and four other species in our Flora, from *Euphorbia* (*Chamaesyce*) *adenoptera*, under which name Boissier (1862) had united them all. Millspaugh transferred all the species to the genus *Chamaesyce*. He distinguished individual species principally on the charac-



ters of the involucrel appendages (whether present or absent, and if present whether glabrous or hairy), and the characters of the seeds; all the species have three- or four-angled seeds with more or less distinct transverse ridges and alternating hollows or furrows (sulci, in Millspaugh's terminology) on the lateral faces. The sulci in some species are said to be "open" (i.e., shallow concavities alternating with acute or narrow ridges), or "closed" (i.e., narrower than the alternating somewhat rounded ridges), or "closed to mere slits" (i.e., appearing as deeply sunken lines between broad rounded ridges). The extremes are easy to recognize but some intermediate states exist. Millspaugh found that of all the species *C. densiflora* was the easiest to recognize, having the glandular appendages hairy on the backs, and spreading hairs on the angles of the stem, these manifestly multicellular and usually with purplish crosswalls. The other species, namely *C. anceps*, *C. dioeca*, *C. inaequalis*, and *C. indivisa*, are not so easily separable.

According to Millspaugh's description, *Chamaesyce dioeca* is unique among these species in having long one-celled hairs on the stems and presumably on the leaves. He emphasized this point, but I have yet to find such hairs on any of his annotated specimens, or indeed on any other. His conclusion may well have been influenced by the fact that the hairs are perfectly colorless, not as in *C. densiflora* with dark walls between the cells, so the individual cells may be difficult to distinguish.

He described the seeds of *C. dioeca* as 0.6 mm long, with 4 closed transverse sulci of which the two basal ones are sometimes anastomosed, the surface of the seed-coat [microscopically] pitted, and the principal angles of the seed not tuberculate (as they are said to be in *C. indivisa*). I cannot say how he obtained this information about the seeds, as the holotype of *Euphorbia dioeca* was said to lack both fruit and pistillate flowers.

In support of his views, Millspaugh cited (1914) about 18 different gatherings representing *C. dioeca*, in addition to as many as two or three duplicates of the same collection, in different herbaria. I have studied seeds of 16 of the gatherings, including all those still at F and a few at MICH, finding to my surprise that two types of seeds are represented among them. All the specimens from Yucatán have seeds like the above (with deep pits and rounded intervening ridges), but only two others, one from the Pacific slope of Guatemala, the other from central Michoacán (*Gregg 812*). All the rest (10) of the collections cited by Millspaugh, from localities in Central America and both eastern and western mainland Mexico, have a different seed, easily recognized as such, in which the transverse ridges are acute and often reduced to a line (suggesting a fold in a sheet of paper), and alternate with shallow concavities round at the bottom. I have called these seeds rippled (or dimpled, when the concavities do not extend the width of the seed-face), in contrast to the seeds with deep pits narrowed at the bottom, and intervening rounded ridges.

This preliminary study led to a survey of the approximately 100 gatherings at F and at MICH, that have been filed under the name of *Euphorbia* (or *Chamaesyce*) *dioeca*, mostly because of their superficial similarity to one another. All plants are pubescent throughout, including the capsule and involucre, all were prostrate or nearly so, and all have glandular appendages in unequal pairs, glabrous or nearly so. It transpired that plants with the two types of seeds are neither randomly distributed nor are they sympatric.

The plant with deeply sulcate seeds, as noted above, is well known in the lowlands of Yucatán, but otherwise the relatively few Mexican and Central American collections all seem to be from inland localities at elevations of 500 m or more,

mostly 500–1800 m in Central America, 500–2300 in Mexico, where it is easily confused with *Chamaesyce indivisa* (e.g., Gregg 812, from Michoacán, cited by Millspaugh as *C. dioeca*). Until further study of South American material can be made, it seems best to keep the name *Chamaesyce dioeca* for this plant that fits Millspaugh's description, if the Mexican representatives of it can really be distinguished from *C. indivisa*. *Chamaesyce dioeca* in this sense is apparently unknown from Nueva Galicia.

The plant with "rippled" seeds has been much collected in lowlands on both coasts of Mexico, from Sinaloa and Veracruz southward, and abundantly throughout Central America at least as far south as Nicaragua. It seems to be absent from the Yucatán Peninsula. It is found on sea-beaches (where it is almost indistinguishable from *Chamaesyce thymifolia*), and commonly at elevations up to about 500–600 meters, rarely to 1000 or 1200 m. I have seen one collection from the interior of Chiapas, apparently from an elevation of about 2000 meters.

This plant is here tentatively referred to *Euphorbia anceps* Benth. (Bot. Voy. Sulph. 162. 1846; Nicaragua, Realejo, ?Barclay, K? or BM?, the type). I have not seen the type, and prefer not to make a formal nomenclatural transfer to *Chamaesyce* at this time, but contemporary Nicaraguan specimens referred to *E. anceps* appear to represent the same species. I cannot separate it satisfactorily from *C. dioeca* (*sensu* Millspaugh) except by the seeds. Millspaugh may not have been fully satisfied with his concept of *C. dioeca*, as he himself (p. 384) stated that "*dioeca* is strongly mutational, hardly two specimens having been seen that exactly duplicate each other." Reports of *Chamaesyce dioeca* from Sin., Nay., and Col., by Millspaugh, probably all refer to specimens of the present species, or perhaps to *C. thymifolia*. A thorough revision of these "vespertilloid" species is urgently needed.

#### NOVELTIES IN, AND COMMENTS ON, *EUPHORBIA*, *SENSU STRICTO*

***Euphorbia caperata*** McVaugh, sp. nov. *Euphorbiae leucocephalae* Lotsy per-similis, sed involucri glandulisque majoribus; appendicibus suborbicularibus vel latissime ovatis ca 1.3–1.5 mm longis latisque, non anguste ovatis vel sublinearibus 1.5–2.5 mm longis et 0.5–1.1 (–1.5) mm latis; stylis paullo longioribus; ovario capsulaque crispe pilosis et confertim rugis tuberculisque carnosus parvisque obsitis (non laevibus glabrisque). Exempla in statu florendi non vidi. Fig. 1.

Forested hillsides near transition between oak-pine and tropical deciduous forest, with *Pseudosmodingium*, *Bursera*, *Lysiloma*, 1300 m in the drainage of the Río Tepalcatepec at the one known locality, with mature fruit 25 Oct.

Jal., Mpio. Tecalitlán, Mata de Bule, Sierra de Los Corales (*Feddem* 2224, MICH, the holotype and only known specimen).

Shrub ca 2 m high, the stem and petioles densely soft-pilose with grayish hairs up to ca 0.5 mm long; inflorescences and herbage similarly but less densely pilose; leaves and axillary branches whorled, 3–6-nate at major nodes of the branches, opposite in the inflorescences; petioles slender, flexuous, 2–4.5 cm long; blades elliptic, those of major leaves 6–8.5 cm long, 2–4 cm wide, obtuse or pointed, and very shortly emarginate at apex, acute or rounded at base, entire and somewhat revolute, dark green and thinly pilose adaxially, much paler (?glaucous) abaxially, densely pilose along the large veins and thinly so elsewhere; lateral veins ca 9–12 on each side; stipules glandiform, minute; cyathia in slender 1–2-forked or umbel-

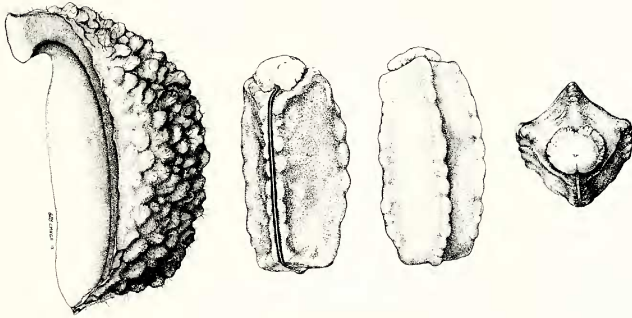


FIG. 1. *Euphorbia caperata* (from the holotype). Left-to-right, one-half of one carpel after dehiscence of the capsule, showing pilose and tuberculate outer surfaces,  $\times 10$ ; seed,  $\times 10$ , adaxial view, abaxio-lateral view, and apical view.

lifiform cymes terminating the whorled axillary branches, these 10–25 cm long including the unbranched basal portion (5–) 9–13 cm long; bracts of the cymes narrowly elliptic, the larger blades 3–4 cm long, 1–1.5 cm wide, those of the ultimate branchlets 7–10 mm long, 3–4 mm wide, glabrous and sometimes red adaxially; specimens in flowering condition not seen; fruiting peduncles of cyathia 2–3 mm long, 1 mm thick; involucre (persisting and surrounding the gynophore) ca 1.5–1.7 mm long excluding the glands; lobes oblong or flabellate, 0.8–1 mm long, lacerate at apex; glands 5, transversely elliptic, 1–1.2 mm long, 0.6–0.8 mm wide (high), unequally concave at apex with the inner side shorter, erect, standing ca at right-angles to the appendage and seemingly arising from the inside of the appendage just above the base; appendages (presumably white) suborbicular to very broadly ovate, narrowed below the gland, rounded at apex, entire, reflexed in age, ca 1.3–1.5 mm long and wide;  $\sigma$  flowers numerous, apparently ca 25; styles glabrous, ca 1.2 mm long, stout, ca 0.2 mm thick, scarcely connate at base, thickened at the outcurved apex, bifid about half their length; gynophore 2.5–3 mm long, less than half its length exerted from the cyathium, 1 mm thick in fruit, erect; columella 4.5–5 mm long, often much dilated at apex; capsule subglobose, slightly 3-lobed, subtruncate at base, broadly rounded at apex, 6–6.5 mm high and wide, crisp-pilose, densely covered and roughened by small fleshy wrinkles and tubercles; seeds oblong, sometimes curved, gray with a dark adaxial line, acutely quadrangular, 3.7–4.3 mm long, the four sides equal or unequal in width, 1.5–1.8 mm wide; sides smooth, concave, the thickened angles smooth or commonly studded with up to 10 large pale tubercles; base truncate, the apex oblique, bearing a fleshy yellow peltate flattish caruncle 1–1.2 mm wide.

The type-collection has previously been identified with a Central American species, *Euphorbia leucocephala* Lotsy (Bot. Gaz. 20: 350. pl. 24. 1895, the four syntypes from Guatemala) to which it is very similar in most respects, and to which it is clearly closely related. A full and direct comparison of the two cannot easily be made, as flowering specimens of *E. caperata* are unknown, and I have been unable to locate fruiting specimens of *E. leucocephala*. In that species many

of the cyathia seem to produce staminate flowers only, as noted by Lotsy in the protologue. In examining 60 flowering specimens, I found pistillate flowers partially exerted from the involucre in 14 only, and in each instance only one or a few, sometimes on a specimen with hundreds of cyathia. Fortunately the involucres, glands, appendages, and styles are sufficiently well preserved in the existing specimens of *E. caperata* to permit some comparisons with a good series of specimens of *E. leucocephala*. The most striking difference is apparently that between the pistillate flowers and fruits of the two taxa. In *E. leucocephala* the ovary (and at least the immature fruit) are completely smooth and glabrous. Most flower-parts seem to be smaller in *E. leucocephala*; the styles in that species are slightly shorter (ca 0.8–0.9 mm long), the involucres only 1–1.25 mm long, the glands 0.5–0.8 (–1) mm long and 0.4–0.55 (–0.6) mm wide; the appendages vary from broadly ovate to nearly linear, from 1.5–2.8 mm long and 0.5–1.5 mm wide, thus from ca 1.8–3 (–4) times as long as wide. In the protologue of *E. leucocephala* it is stated the seeds lack a caruncle, but this is doubtful.

Originally *Euphorbia leucocephala* was based on four specimens, without any indication of type, all from Guatemala, viz. *Shannon 305* and *Heyde & Lux 3661, 3482, and 6377*. Standley (Contr. U.S. Nat. Herb. 23: 603, 1923), presumably working under the American Code of Nomenclature, chose the first collection cited in the protologue as lectotype. He cited no collector, but stated that the "type" was from Cuilco, Shannon's locality; later (Fieldiana Bot. 24, part 6: 107, 1949) Standley & Steyermark designated *Shannon 305* as "type," i.e., lectotype. The specimen at US!, from John Donnell Smith's herbarium, is skimpy but readily identifiable.

***Euphorbia creberrima*** MeVaugh, sp. nov., a *E. furcillata* trichomatum minutissimorum creberrimorum indumento pallido, umbellis brevissimis 1–2 (–5) cm longis, radiis ca 5, 4–8 (–12) mm longis, involucri bracteis patentibus vel reflexis ovato-lanceolatis, antheris valde exertis, pedicellis 0.8–1.4 mm longis, stylis longioribus (1.3–) 1.8–2 mm longis differt.

Grassy openings and along arroyos in dry oak-pine forest, 2200–2450 m in Nueva Galicia as far as known, in the northern part of the Santiago basin at the edge of the Central Plateau, found flowering (but mostly only ♂ flowers yet developed) in early November, fruiting in March.

S Dgo., n Jal. (Mpio. Mezquitic, 8–10 km SE of El Mortero, road to Monte Escobedo, Zac., near the Jal.-Zac. border, in shade of oaks, 2450 m, *Feddesma 2452*, MICH, the holotype).

Dgo., Mpio. Mezquitic, between El Durazno and Xoconostle, pine-oak forest (*M. González E. 1184*, TEX); Jal., Mpio. Mezquitic, 5 km E of Rancho El Mortero, forest of *Pinus lunholtzii* and *Quercus "macrophylla"* [i.e., *resinosa* ?], 2200 m (*Rzedowski 17695*). Rzedowski's collection and the type were taken from nearly the same locality; the Durango locality is about 100 km farther northwest. The species is otherwise unknown.

Described as a low shrub, the basal parts unknown, the inflorescences terminal on slender strongly ascending leafy branches 20–35 cm long, the branches woody, evidently arising as lateral offshoots from aborted stems of one or two previous years, the older leafless stems 2–3 mm thick with many old leaf-scars; herbage and branches very densely beset with innumerable and incredibly short erect pale trichomes, the longest of these on the twigs ca 0.2 mm long, those on the abaxial leaf-surfaces much shorter, and on the adaxial surfaces and the cyathia mostly reduced to mere papillae; cauline leaves very numerous for 10–20 cm

below the inflorescence (8–10 to each cm of stem, or on rapidly growing twigs only 2–3 to each cm), the older twigs naked with closely beset leaf-scars; blades spreading to markedly reflexed, narrowly lanceolate to elliptic or oblanceolate, 1.5–4 cm long, 3–6 mm wide, rather abruptly narrowed at base to a slender petiole ca 1 mm long, acute and mucronate at apex; inflorescences rather sharply differentiated at the tips of the leafy twigs, forming small corymbs 1–2 (–5) cm high and 1.5–4 cm wide, consisting of ca 5 rays in a small umbel subtended by an involucre of sessile, lance-ovate, spreading to reflexed bracts ca 12–25 mm long and 4 mm wide; rays 4–8 (–12) mm long, at apex 2 (–3)-forked, the cyathia ca (15–) 30–50 at the periphery of the corymb, on peduncles up to ca 1 mm long, the bracts at the forks broadly elliptic or obovate, acuminate, up to ca 8 mm long and 5 mm wide, the uppermost smaller; involucre about as in *Euphorbia furcillata* but mostly smaller, 1.3–2 mm long exclusive of the lobes and glands; glands 4, crescent-shaped, or scarcely curved and shaped like a flattened semicircle, 1.5–2.3 mm long, 0.7–0.8 mm wide (high), pointed at the ends but mostly not cornute, the distal margin entire or obscurely erose; ♂ flowers 20–30, at least the central ones much exerted (the tips of the androphores as much as 1.5–2 mm), the pedicels 1–1.4 mm long; styles (1.3–) 1.8–2 mm long, connate ca 0.7 mm at base, bifid about one-third their length, the tips subcapitate; ovary minutely papillose, the capsule essentially smooth; gynophore minutely papillose, 4–4.5 mm long, usually strongly recurved, the collar ca 1 mm wide; capsule broadly ovoid with 3 prominent rounded lobes, rounded and with depressions at both ends, wider than long, ca 3.5 mm long, 4–4.5 mm wide; columella 2.5–2.8 mm long, with 3 triangular acute projections at apex; seeds ovoid-oblong, 2.3–2.5 mm long, 1.5–1.7 mm in diameter, rounded at base, more or less terete with a well-marked adaxial line, obliquely angled at apex, with a flattish peltate caruncle 1–1.2 mm wide; surface smooth but mottled in a raised-reticulate pattern, dull brown with paler or whitish ridges.

In addition to the characteristic indument, this plant differs from most specimens of *Euphorbia furcillata* in the smaller corymbs that stand well above the leaves, in the longer styles and longer anther-pedicels. The relationship to *E. furcillata* is apparent in almost every feature. The latter is very variable in habit and in floral characters, and individual plants that exactly match *E. creberrima* in one character or another, except for the indument, are occasionally found.

Indument in this species, as described above (I hesitate to call it pubescence, because the individual trichomes in no way resemble ordinary hairs), is so dense as to give the herbage a grayish tinge, and so small that the individual trichomes (or papillae) can scarcely be discerned with a 10-power lens. Each epidermal cell is produced into an upright conical structure with large lumen and heavy lignified outer walls. Such structures are among those characterized by Metcalfe & Chalk (Anatomy of the Dicotyledons. ed. 2. 1: 152. fig. 10.13, e. 1979) as intermediate between papillae and hairs<sup>1</sup>.

These epidermal outgrowths in *E. creberrima* are almost incredibly like those of *Euphorbia ivanjohnstonii* M. C. Johnston (Wrightia 5: 129. 1975, the type from northwestern Coahuila, Sierra Santa Fe del Pino, *M. C. Johnston et al.* 11237, TEX!, the holotype). I have seen this collection, and the only other known collection, from the same mountain range (*I. M. Johnston & Muller* 512, TEX), through the kindness of Dr. Guy L. Nesom. Though this type of indument appears to be

<sup>1</sup> I am indebted to my colleague W. C. Dickison for demonstrating the internal anatomy of these epidermal outgrowths, and for calling the pertinent literature to my attention.

unique in this group of species, and indeed in Mexican *Euphorbias* in general, and perhaps indicates some distant relationships among the taxa that share it, there can hardly be any doubt that *E. ivanjohnstonii* and *E. creberrima* constitute different species. The former is apparently a shorter plant, subherbaceous except at base, with shorter, more nearly ovate and relatively much wider cauline leaves, the cyathia not confined to a distinct terminal corymb but in part lateral on short axillary shoots. The cyathia are similar in the two taxa, but in *E. ivanjohnstonii* the glands are less than half as large as those of *E. creberrima*, the ♂ pedicels are much shorter and (in the two known specimens) not long-exserted.

I have been influenced by the same feature, that is to say the presence of almost the identical indument in taxa that are well separated geographically, but not detected elsewhere in the variable *Euphorbia furcillata*, to treat *E. creberrima* as a distinct species coordinate with *E. ivanjohnstonii*, rather than as a variety of *E. furcillata*. Additional fieldwork in the range of *E. creberrima* might well provide new information about the species, its variability, and its relationships with *E. furcillata*.

Another species with indument nearly like that of *E. creberrima* and *E. ivanjohnstonii*, but a true shrub with large strongly cornute glands consisting chiefly of two divergent "horns" about 1 mm long, is *Euphorbia longicornuta* S. Wats. (Proc. Amer. Acad. 25: 161. 1890, the type from the summit of the Sierra de la Silla, near Monterrey, Pringle 2545).

***Euphorbia graminea*** Jacq. Sel. Stirp. Amer. 151. 1763; Obs. Bot. 2: 5. pl. 31. 1767.

Various authors in floras of tropical America, where this species is widely distributed, have emphasized the extreme variability of what seemed to them to be a perplexing complex of weedy plants often described as perennials, much in need of taxonomic study. Ours seems to be a well-established native species, a common herbaceous plant in moist shady places, not especially weedy, annual or of short duration, mostly glabrous or at least not conspicuously hairy, not unreasonably variable, but showing in Nueva Galicia several identifiable facies. The complex would benefit from a thorough modern revision covering its whole geographical range. The following notes are based on study of a large series of specimens, including those identified as *Euphorbia graminea* at F, MICH, MO, TEX, and US.

It is quite clear that *Euphorbia graminea*, as that species is commonly understood by compilers of American floras, includes the type of *Euphorbia graminea* Jacq. The description in the protologue of that name (1763) is suggestive but provides no conclusive evidence of the identity of the plant that Jacquin had. Such evidence was supplied by Jacquin in 1767 (Obs. Bot. 2: 5. pl. 31.). There he referred to his earlier publication and added some comments [English version by R. McV.]:

"I called [this] *Euphorbia graminea* because it grows in meadows among grasses, which support [the] weak [stem]. The *icon* shows at natural size [*duntaxat*] a branch of the dichotomous plant. I added the corolla [i.e., the involucre], split open, unfolded and enlarged, the better to show the two glands and lobes, which is all it has."

The figure shows the upper part of a widely forking floriferous plant, with internodes about 15 cm long above the first fork, and the succeeding internodes about 6.5–8.5 cm long above the second forks, then loose terminal clusters of

cyathia with some exerted apparently immature fruits. The enlargement shows the inner side of the involucre, with two large rounded terminal appendages projecting well beyond the involucre (the glands proper not shown), and with conspicuous hairy lobes inside the glands. This agrees well with, and supplements, the original description (1763), in which the leaves were characterized as opposite, entire, lanceolate, acute, lustrous, one and one-half inches long, few, on petioles an inch long, and the plant itself as herbaceous, erect, weak, all green and dichotomous, slender, two to three feet high, with the *pedunculi communes* [that is to say, the long floriferous upper branches] terminal, dichotomous, erect, and slender. The fact that Jacquin mentioned and illustrated opposite leaves only, implies that he studied, and perhaps collected, no more than the tops of the tall plants growing among grasses, and failed to observe the presence of alternate leaves that may well have been concealed among thickly growing grasses, or may have already fallen from the plant.

Through the kindness of Dr. Roy Vickery and Dr. F. R. Barrie of the British Museum (Natural History) I have been able to examine a specimen at BM, from Jacquin's herbarium. No geographical origin is specified, but it may be the same specimen, from "Venezuela," that Boissier (1862, p. 54) reported as having been seen in Banks' herbarium (now at BM). The specimen now at BM could perfectly well have served as the model for the illustration published by Jacquin in 1767, consisting as it does of the upper part of a plant, twice forked, with long internodes and few-flowered cymes with small bracts. The cyathia are quite typical of *E. graminea* as commonly understood, with two prominent glandular appendages, and the small bracts are narrow and evidently were whitish when fresh.

Plants of the above description are known from many localities in northern Venezuela and Colombia, as far as known of annual duration, commonly with long forking upper branches and with two (as described by Jacquin) or four involucre glands. In some specimens the appendages are unusually large and rounded for the species, resembling those drawn by Jacquin. Similar plants are common throughout Central America and Mexico. I have no hesitation in including in the circumscription of var. *graminea*, as segregated below, all similar plants with either two or four glands.

In general I find few obvious correlations between the number of glands and any other feature, though in Nueva Galicia, as discussed below, it seems clear that the variation is not random. The number has been stated baldly by various authors, again following Boissier (1862), as 2-4. The number does indeed vary from 2 to 4 (even rarely from 1 to 5). Variation from 2 to 3, 2 to 4, or 3 to 4, may occur in the same plant. Observation suggests (though the truth should be ascertained through field studies) that well-developed cyathia that are terminal at major forkings of the branches, may be larger and with more glands than those that are more crowded near the tips of flowering branchlets. Examination of a large suite of specimens from Mexico, Central America, and northern South America, shows that plants with 4 glands outnumber those with 2 glands in many parts of the range, sometimes in a ratio of as much as 2-4:1. On the other hand, plants with 2 glands seem to predominate in parts of northern Colombia (the type-region) and Venezuela.

Growth-form is so much influenced by environment, and so dependent upon the age of the plant, that it is not in itself very useful in dealing with herbarium specimens. Plants growing among grasses and competing with them presumably tend to become more elongated and with fewer basal branches than open-grown

plants of sandbars and roadsides. Plants just coming into flower usually lack elongate branches. Although the var. *graminea* remains in this respect a loosely defined entity, a survey of the available specimens suggests that throughout the range the prevailing plant-habit is the one described by Jacquin, mostly an annual plant with long dichotomously branching upper branches and either 2 or 4 involucre glands.

Leaf-shape throughout the range of the inclusive *E. graminea* is highly variable. Various collectors in different parts of the range have noticed this, now taking linear-leaved and broad-leaved specimens from the same locality, sometimes without comment but evidently supposing them to represent the same species, then again assigning different collection-numbers to two extreme leaf forms. Although in some extreme forms the cauline leaves are all narrowly linear, and at the other extreme all broadly ovate to suborbicular, there is a recognizable sequence in most well-developed plants from broad or very broad leaves near the base of the stem to narrower or even linear leaves in the upper part, where the stem is repeatedly forked. This progression, and indeed even the presence of broader leaves on the lower part of the stem, may not be discernible in herbarium specimens, because collectors tend to take the upper parts of large bushy plants, at a time when flowering is well advanced, and the lower cauline leaves have fallen. In younger plants, on the contrary, all the leaves on a given specimen may be broad, whether or not the plant will eventually produce long upper branches bearing narrower leaves.

It is beyond the scope of this paper to undertake a revision of the species (or species-complex) much beyond the borders of Nueva Galicia. Several taxa closely similar to but perhaps actually conspecific with *Euphorbia graminea* have been proposed, as for example *E. montereyana* Millsp. (Bull. Torrey Bot. Club 16: 66. 1889, the type from the Sierra Madre near Monterrey, N. L., Pringle 2069, F!, the holotype). This is apparently a local entity of the sierras from Tamaulipas to Nuevo León, recognizable usually by the presence of four or five glands and relatively large white glandular appendages, but variable like the rest of the species in habit and leaf-form. In southeastern Mexico, and especially from Chiapas to Honduras and Nicaragua, there is an increasing prevalence of forms with conspicuous petaloid inflorescence-bracts and ternate leaves (sometimes difficult to distinguish from *E. ariensis* H. B. K., a plant primarily of south-central Mexico, or from *E. leucocephala* Lotsy, a primarily Central American species). I have characterized some of these in annotations as part of an unresolved "Central American complex" related to *E. graminea*. Many specimens in this geographical area are obviously from perennial plants, sometimes described by collectors as shrubs, with woody roots and with larger and heavier stems, often said to be 1-3 m high, than those of plants from central Mexico. Many specimens are densely pilose and often scabrellous. In the *Flora of Guatemala* (Fieldiana Bot. 24, part 6: 91-92, 102, 113. 1949) a "rough-hirtellous, pilosulous or glabrate" plant with pure white inflorescence-bracts was treated under the name of *Euphorbia scabrella* Boiss. (in DC. Prodr. 15, part 2: 55. 1862; Ic. Euph. 14, pl. 32. 1866, the five syntypes from Mexico and Central America), and *E. graminea* was treated as a distinct species, "usually more or less pilosulous with spreading or crisped hairs, often glabrate," with green inflorescence-bracts. In Nueva Galicia the heavy pubescence and the larger petaloid bracts do not appear to be correlated. Almost all our specimens, if not glabrous, are sparsely and softly pilosulous to some extent, and the bracts are usually white but often small and inconspicuous. As remarked above, the floral



bracts in Jacquin's specimen were certainly white, at most with a greenish midline, but definitely not green. The resolution of this problem, as remarked in the *Flora of Guatemala*, awaits a careful modern revision of the whole complex.

In Nueva Galicia the situation seems less confused, and there appear to be three principal variants that are treated below as two varieties and a form of *Euphorbia graminea*. The prevailing extreme, which I take to represent *Euphorbia graminea* in the sense of Jacquin, occurs in the Pacific lowlands, and is also well known at elevations up to 500–1200 (–1500) m above sea-level. This is the plant discussed just above under the name of var. *graminea*, in which the glands are four or here less often two in number, the leaves mostly ovate to narrowly oblong, the inflorescence divaricately forking with long internodes extending well above the larger leaves, the ovary and capsule glabrous, seldom papillose. Collectors rather seldom take the underground parts of plants, but about 20 specimens from our area have what appear to be annual taproots, with fleshy tuberiform or moniliform thickenings noted on at least six of these.

In relatively humid montane forests, mostly between 1000 and 2200 m above sea-level, the prevailing population is what has been called *Euphorbia galiciana*, here considered to represent a variety of *E. graminea*. The glands are commonly 4, at least the major leaves linear or nearly so, the inflorescence more or less strongly suffused with purple-red, and with long and strongly ascending forking branches, the ovary and capsule glabrous. Plants often flower the first year from a small taproot, but 8 out of 13 specimens include what appear to be persistent stem-bases from a previous year.

Finally, in the Pacific lowlands and found sparingly at inland localities up to an elevation of 1900 m, is a plant in which the glands are usually two in number, the leaves relatively broad (even the upper ones often ovate to rotund), the inflorescence often leafy without conspicuously elongate branches, and the ovary and capsule often minutely glistening-papillose. On the basis of the available specimens (20 in number) that include basal parts, the plants seem to be strictly annual. This is treated here as a form rather than a variety, because although in Nueva Galicia the distinctive habit seems to persist even in old fruiting plants, in other parts of the range of the species plants of similar appearance can usually be identified as immature individuals of var. *graminea*.

Intermediates between the above taxa are not rare. The extremes are here given the status of a form and two varieties, in order that they may be identifiable by means of the types, but final resolution of the complex, and better definition of the infraspecific taxa, must depend upon research in the future.

The distribution of the inclusive *Euphorbia graminea*, as mentioned in literature and as ascertained from material in herbaria, is summarized below and the following general description is intended to apply to the species as a whole, as represented in our area:

Son., s w Chih., Sin., Dgo., Nay., Gto., Jal., Col., Mich., Gro., Méx., Qro., Mor., D.F., Oax., Pue., Ver., Hgo., Tamps., N.L., Coah., Yuc., Chis.; Centr. Amer.; ?W. Ind.; n S. Amer. ([Colombia, Cartagena], *Jacquin*, BM!, the lectotype here designated, corresponding well with the illustration in *Jacq. Obs. Bot. 2: pl. 31. 1767*).

Annual or of indefinite duration, up to 1.1 m high, usually 50 cm or less, freely branched, the branchlets nearly glabrous or somewhat pilose to densely pilose (especially on the basal parts of the plant) with pale tapering flaccid hairs up to 1 mm long; leaves petiolate, moderately pilose or strigose with similar hairs, scabrid on the margins, alternate except for 1–3 pairs at the base of the stem and

those subtending forking branches of the inflorescence; blades entire, the principal ones (subtending alternate branches near mid-stem) usually largest, the lower ones commonly shorter and wider and often more obtuse at apex, the upper ones commonly narrower; stipules glandlike, up to 0.5 mm long, commonly very soon deciduous; stems and branches mostly 2-4-forked in about the distal one-third or only near the tips, the internodes sometimes much elongate and the cyathia in small and seemingly pedunculate terminal clusters subtended by very small petiole-ovate obovate or spatulate to lanceolate or linear bracts, these white or pale green or white with a green midline, or tinged with pink or purplish red, 3-7 mm long and 1-2 (-3) mm wide; peduncles up to ca 15 mm long, the lateral ones, or all of them, usually much shorter; involucre campanulate or funnellform, (1-) 1.5-1.8 mm long excluding the appendages and lobes, sometimes strigose distally on the outer surface; lobes white, relatively conspicuous (sometimes as long as the appendages), oblong or quadrate, or rounded at apex, ca 0.7-0.8 mm long and wide, fimbriate at apex; glands transversely elliptic or rotund, 0.25-0.4 mm long, 0.1-0.25 mm wide (high), the bases of the appendages closely surrounding and enveloping them; appendages mostly thick and relatively stiff, internally sulcate and conforming to the shape of the gland, thus convex externally at base, green at base and sometimes along the midline, or all green, laterally and distally white or purplish (sometimes all purplish), commonly ovate or deltoid-ovate as seen from without, (0.3-) 1 (-1.6, or rarely -1.8) mm long, (0.4-) 0.6-0.9 mm wide; ♂ flowers ca 40 (-250); styles 0.7-1 mm long, bifid two-thirds their length or nearly to the base; gynophore 2.8-4.5 mm long, straight or strongly recurved; capsule strongly 3-lobed, 2.5-3 mm long and 3-3.5 mm wide; columella 1.6-1.9 mm long, broadly winged; seed (1.3-) 1.5-1.7 mm long, 1.3-1.5 mm in diameter, gray or brownish rust-color to almost black, with 3-4 shallow angular pits in each of 6-8 (-10) longitudinal rows, the surface usually beset with many small brownish tubercles and the angles between the pits usually coarsely tuberculate.

1. Glands of the involucre usually 2 (seldom 3 or 4); ovary and capsule commonly very densely and minutely glistening-papillose; petioles of major leaves mostly 15-30 (-60) mm long, the blades ovate or elliptic to suborbicular, 2-5 cm wide, ca twice as long as wide, or up to as wide as long; inflorescence branches commonly forked near the tips only, the distal internodes 3-5 cm long or less, and the cyathia not much surpassing the foliage; from near sea-level to ca 1900 m. *forma foliosa.*
1. Glands of the involucre usually 4 (less often 3 or 2, rarely 1 or 5); ovary and capsule commonly smooth and glabrous, sometimes minutely scurfy; petioles of major leaves various; blades various; stems repeatedly forked throughout the upper one-third or one-half of the plant, the internodes above the forks elongated (up to 5-10 cm long or more), and the cyathia supported well above the foliage.
  2. Inflorescence (floral bracts, cyathium and appendages, gynophore and sometimes ovary, and anthers) more or less strongly suffused with purple-red; distal branches of the upper forks strongly ascending; petioles of major leaves 4-10 mm long; blades prevalingly linear to narrowly elliptic or oblong, those of major leaves at and below the lowest forks (2-) 3-6 (-10) cm long, (1-) 2-5 (-7) mm wide, (7-) 10-15 (-30) times as long as wide; leaves at the lowermost nodes of the stem if present small, elliptic to suborbicular, (0.3-) 0.8-2.2 (-3.5) cm long, 0.3-0.9 (-1.5) cm wide, mostly 1.2-2.5 (-4) times as long as wide; plants 20-50 cm tall, in humid montane forests, 1000-2200 m. *var. novogaliciana.*
  2. Inflorescence usually without purple-red coloration; floral bracts white or usually greenish abaxially or along the midline; appendages green at base and commonly along the midline, usually white distally and laterally; distal branches of the upper forks divaricate to ascending; petioles of major leaves (5-) 10-20 (-45) mm long; blades except sometimes those subtending the upper forks of the stem not linear, those of the major leaves

lanceolate or the lower ones ovate, 3–7.5 cm long, (1.5–) 2–3 cm wide, 1.6–3 (–5) times as long as wide; leaves at the lowermost nodes, if rarely present at flowering time, smaller than but not conspicuously different in shape from the other cauline leaves; plants often coarse, sometimes flowering when 20–50 cm tall, but often 80–110 cm tall; near sea-level to ca 1500 m, commonly in deciduous forest. var. *graminea*.

***Euphorbia graminea* forma *foliosa*** McVaugh, f. nov., foliosa, foliorum laminis ovatis, ellipticis suborbicularibusve, 2–5 cm latis, duplo longioribus quam latioribus; foliorum majorum petioli 1.5–3 (–6) cm longi; inflorescentiae rami prope apices plerumque furcati, internodiis distalibus 3–5 cm longis vel brevioribus, cyathiiis folia non multo excedentibus; involucri glandulae plerumque 2, raro 3 vel 4; ovaria capsulaeque plerumque densissime et minutissime puberulo-papillosae.

Ravines, moist or rocky slopes, stream valleys, sometimes in disturbed habitats, in tropical deciduous or subdeciduous forest, or barranca-forest with *Carpinus*, *Magnolia*, and *Quercus*, sea-level to 1900 m, most common at lower elevations on the Pacific slope, and inland to the high valleys of the Santiago basin, flowering Aug–Nov. Known chiefly from Nueva Galicia.

Sin., s Zac., Nay. (mountains “9.5 mi” W of Tepic, [road to Jalcocotán], McVaugh 18943, MICH, the holotype), Jal., ?Mich., ?Gro.

Zac., pastured hills “5 mi” SW of Jalpa (McVaugh 18499); Nay., mountains “10 mi” SE of Ahuacatlán, road to Barranca del Oro (McVaugh & Koeltz 805); oak woods on volcanic rock, road to Compostela, 25 km S of Tepic (Webster & Breckon 15678, MICH, MO); 1 km N of El Cuatante, ca 40 km (airline) N of Puerto Vallarta, Jal. (Feddema 2649); in oak zone, 200 m, 11 km on road to Compostela, E of Las Varas (Dieterle 3968); Jal., Tequila (Pringle 5443, glands 4!); ca 3 km SE of Puerto Vallarta, canyon of Río Cuale (Feddema 2524); above La Cuesta, road to Talpa de Allende, below the pass, 800–1400 m (McVaugh 20260, 21167); west branch of Río de Talpa, “11–12 mi” S of Talpa (McVaugh 20410); Mpio. La Huerta, camino a Nacastillo, ca 9 km E of Juan Gil (Lott 2662); 16 km E of Ameca (Lott 1285, F); 3 km NE of Cd. Guzmán (Cutler 4098, F); mountains N of Lake Chapala, 1500–1900 m, between Jocotepec and San Juan Cozalá (McVaugh & Koeltz 345, glands 4!); barranca of Río Verde, between Tapatitlán and Yahualica (McVaugh 17364): “2 mi” SW of San Juan de los Lagos, in a ravine (McVaugh 17631). All specimens at MICH except as noted.

Small flowering specimens that perhaps belong here are: Nay., Mpio. San Blas, ca “3 mi” E of Jalcocotán (Norris & Taranto 14987, glands 4); Jal., Mpio. La Huerta, Pueblo Careyes, ca 7 km SE of the Estación Biológica Chamela (Lott 2685, glands 5!).

Plants of this form are usually recognizable at sight by the broad leaves that extend nearly or quite to the top of the plant, without marked distinction in shape between cauline and bracteal leaves, and by the position of the cyathia, these little or not at all surpassing the upper leaves. Correlated with these features, but not entirely consistently, are the presence of two glands in the involucre and the presence of minute papillae that cover the ovary and persist to some extent on the capsule. The plants as far as known (15 specimens with basal parts) are always annual from a small taproot; there are no known reports of perennial roots, nor of tuberous thickenings in the roots.

The taxonomic standing of this entity is not clear. Young plants of *Euphorbia graminea* often begin to flower at a time when most of the original broader cauline leaves are present, and before any considerable elongation of the distal branches. Especially if the glands of the involucre are two in number, dried specimens of such plants exactly simulate f. *foliosa*. It is impossible to determine whether or not the branches would have elongated, with the production of narrower upper

leaves, if the plant had been allowed to continue its growth. Fully mature specimens of *f. foliosa*, however (e.g., *McVaugh & Koelz 805*), though the upper bracteal leaves are narrow, lack the conspicuously long internodes of var. *graminea*. It seems that the form has some reality as an entity at least in our area. Similar plants with mostly broad leaves, either with two or with four glands, and relatively little elongation of the flowering branches, occur sporadically throughout the range of the species. Field-study to determine the status of the form, in Nueva Galicia and elsewhere, would be desirable.

***Euphorbia graminea* var. *graminea*.** *Euphorbia graminea* Jacq., as to type. *Euphorbia colimae* Rose, Contr. U.S. Nat. Herb. 1: 356. 1895. *Euphorbia graminea* var. *lancifolia* Millsp. Field Mus. Publ. Bot. 1: 372. 1898. *Euphorbia graminea* var. *virgata* Millsp. Field Mus. Publ. Bot. 1: 372. 1898. *Euphorbia longepetiolata* M. E. Jones, Extr. from Contr. West. Bot. 18: 55. 1933.

In Nueva Galicia in moist or moderately dry places, forest openings, rocky bluffs, deep ravines, sometimes on limestone, sometimes in disturbed habitats, tropical subdeciduous forest with *Orbignya*, *Hura*, and *Brosimum*, deciduous forest with *Cordia*, *Bursera*, and arborescent *Ipomoea*, sometimes in oak or pine forest, sea-level to 1200 (–1500) m, chiefly on the Pacific slope, flowering (Aug–) Oct–Dec.

Nay., Jal. (La Barranca, Guadalajara, *M. E. Jones 27514*, POM\*, holotype of *E. longepetiolata*; F\*, GH!, isotypes), Col. (Colima, *Palmer 1170* in 1891, US, holotype of *E. colimae*; F!, GH!, isotypes), Mich.; outside Nueva Galicia occupies essentially the range of the species: Yuc., Izamal (*Gaumer 969\**, F!, holotype of var. *lancifolia*; US!, isotype); Tekax (*Gaumer 1128\**, F!, holotype of var. *virgata*; US!, isotype).

Representative specimens from Nueva Galicia: Nay., steep mountainsides on the descent “19 mi” NW of Tepic, road to Mazatlán, Sin. (*McVaugh & Koelz 721\**); Xalisco (“Jalisco”) (*Ferris 5902*, US\*); Jal., Mpio. Cabo Corrientes, 8.3 km from El Tuito, road to Ixtlahuahuey (*Ayala 352\**); Mpio. La Huerta, near Estación de Biología Chamela (*Lott 1424*, MO\*); hills between Bahía de Navidad and Bahía de Tenacatita, road to La Manzanilla (*McVaugh 21021*, ovary puberulo-papillose); coastal plain “4 mi” N of Bahía de Navidad, road to Autlán (*McVaugh 20816*); seaward-facing slopes “13 mi” SW of Autlán, “4 mi” below the highway pass, (*McVaugh 19894*); many other collectors: *Webster & Breckon 16060*, ovary puberulo-papillose); road to Mina de San Francisco, N of Autlán, disturbed hillsides (*Lott 2735*, ovary papillose); Puente Barranquitos, 700 m, 17 km E of Jal-Nay border (*Burch 5387*, MO\*); 23 km NW of Magdalena (*Burch 5345*, MO); Mpio. Tlaquepaque, Barranca de Colimilla (*Díaz Luna 2614\**); above Ahuacapán, ca “10 mi” SE of Autlán, road to Corralitos (*McVaugh 19550*); Sierra de Manantlán, E of [Rancho] Manantlán, ca “5400 ft” (*Wilbur 2055*); with *Curatella* and *Byrsonima*, 2 km N of Pihuamo (*McVaugh & Koelz 1385*); Mpio. Tecalitlán, Mata de Bule, near Los Corales (*Rzedowski 17491*); between Sierra de los Corales and Tepalcatepec, Mich. (*Feddema 2239*); Col., Colima (*Palmer 107* in 1897); eroded limestone ridge at km 204, ca “10 mi” SE of Cd. Colima (*McVaugh & Koelz 1459*); Mich., rocky slopes S of Lake Chapala, km 543, ca “8 mi” NW of Sahuayo (*McVaugh 18177\**); Aquila, woods by the beach (*Hinton 12625*); Distr. Apatzingán, Aguililla (*Hinton 15297*); Mpio. Arteaga, 9 km N of El Infiernillo (*Lott 2002*, F, MO). The asterisk (\*) denotes specimens found to have 2 (–3) glands in the involucre examined; the remaining specimens were found to have 4 glands. In *Gaumer 969* the number of glands appears to vary from 2 to 4.

This variety is more generalized than the preceding and following taxa; for the most distinctive features see the key above. The cauline leaves are intermediate in shape between those of var. *novogaliciana* and those of *f. foliosa*. The long slender fertile branchlets, usually with bracts noticeably different from the cauline

leaves, commonly extend well beyond the foliage, as in var. *novogaliciana*, but the branchlets tend to fork at a wider angle than in that variety, and the cyathia and small bracts are almost invariably white or green, without purplish coloration. The involucre glands are commonly 4 in number, and the ovary and capsule are often (but by no means always) glabrous, not papillose. The roots are often clearly annual, but of plants with basal parts (17 from Nueva Galicia), tuberous or moniliform thickenings in the roots are present or have been noted by collectors in about one-third of the specimens.

It is sometimes difficult to assign a young plant with relatively narrow leaves to one variety or another. One such specimen, from Jalisco, Mpio. Tamazula, near Agua Hedionda, at 1900 m in pine-oak forest (*Rzedowski & McVaugh 1150*), consists of flowering plants 15–25 cm high, with narrow but not linear cauline leaves 2–3.5 cm long and 4–8 mm wide. The habitat, the size of the plants, and the type of branching suggests a form of var. *novogaliciana* with unusually broad leaves, but the branches are divaricate, the cyathia and small bracts are green and white, not at all purplish.

***Euphorbia graminea* var. *novogaliciana*** McVaugh, var. nov. *Euphorbia galiciana* McVaugh, *Brittonia* 13: 173. figs. 19–21. 1961, as to type.

Known chiefly from Nueva Galicia. Representative specimens were cited in *Brittonia* 13: 174. 1961.

Plants are usually recognizable by their small stature (stems mostly 20–50 cm high), the linear or nearly linear leaves, the very narrowly ascending flowering branches overtopping the leaves, and the presence of a pink or purplish red color in various parts of the inflorescence. The bracts of the cymes are usually much reduced and scarcely foliaceous but petaloid and conspicuous, the ultimate ones oblanceolate, ca 4–5 mm long and 1 mm wide. Plants often flower the first year from a small taproot, but they appear to be of indefinite duration; it is not uncommon (seen in 8 of 13 specimens with basal parts) to see the bases of old stems subsistent above a somewhat heavier and apparently older root.

The choice of a new and more appropriate epithet instead of the original *galiciana* is sanctioned by the International Code of Botanical Nomenclature, Art. 60, which states that in no case does a name have priority outside its own rank.

***Euphorbia ocymoidea*** L. Sp. Pl. 453. 1753.

This is a slender annual, originally described from Campeche, Mexico, widely distributed in Mexico and Central America, and comprising several geographically segregated varieties. From the lowlands of Tamaulipas and San Luis Potosí, the central foothills of the Atlantic slope of Veracruz, and northeastern Guerrero, to Central America as far as Panama, most plants are readily identified by the profusion of slender gland-tipped hairs on the young branchlets, and by the presence of five (less often four) glands in the involucre, and a pubescent ovary and capsule. On the Pacific slope of Mexico, from Sonora south to Michoacán and México and east to the highlands of west-central Veracruz (Mpio. Jalacingo), the Valley of Mexico, and Morelos, the prevailing form is a plant with few or no glandular hairs, short branches and small leaves, pubescent ovary and capsule, and four glands in the involucre. Finally, in a relatively small area on the Pacific slope in Jalisco and Michoacán, is a third variety in which the herbage is nearly glabrous, the ovary and capsule glabrous, and the glands five in an involucre. The species is not well known through modern specimens from the Yucatán Peninsula, but all

known examples are glandular-pilose, so it was not a surprise to find that the original specimens from Campeche were that way also. Of the three varieties here recognized, one has gone unnoticed since its description in 1913 at the rank of species, whereas most Mexican and Central American specimens have been referred to *Euphorbia ocymoidea* (as the oldest name at species rank), to *E. astroites* (if glandular-pilose), or to *E. subreniformis* (if Mexican).

1. Ovary and capsule glabrous; gynophore 3–5 mm long, very slender to capillary; branchlets not glandular-pilose; glands of the involucre 5; cyathium, glands, and appendages not or rarely reddish; stems diffusely branched from the first, the strong lateral branches often as long as the central axis. var. *barnesii*.
1. Ovary and capsule strigose or pilose; gynophore commonly 1–2.5 (–4) mm long, not conspicuously slender.
2. Young branches copiously pilose with slender gland-tipped hairs; glands of the involucre usually 5, sometimes 4 in addition to a smaller one, or seldom 4 only; branching variable, the plants often diffusely branched with strong lateral branches as long as the central axis. var. *ocymoidea*.
2. Young branches not copiously glandular-pilose, from nearly glabrous to sparsely pilose, sometimes with very sparse gland-tipped hairs on the internodes, often with a very few extremely short clavate hairs near the nodes; glands of the involucre 4, commonly reddish, the cyathium and appendages almost always with some reddish coloration; stem (except when injured) and the few large primary branches usually maintaining a strong central axis with short lateral branches all about the same length. var. *subreniformis*.

***Euphorbia ocymoidea* var. *barnesii*** (Millsp.) McVaugh, comb. nov. *Adenopetalum barnesii* Millsp. Field Mus. Publ. Bot. 2: 377, 1913. *Euphorbia barnesii* (Millsp.) Oudejans, Phytologia 67: 44, 1989.

***Euphorbia ocymoidea* var. *ocymoidea*.** *Euphorbia ocymoidea* L., as to type. *Euphorbia astroites* Fisch. & Mey. Index Sem. Hort. Petrop. 10: 44, 1845. *Euphorbia astroites* var. *heterappendiculata* Millsp. Field Mus. Publ. Bot. 1: 28, 1895.

There appears to be no incontestable way to typify *Euphorbia ocymoidea*. It is possible, or even likely, that Linnaeus never saw a specimen. In 1753 he took the name and the specific character from his own Dissertation on *Euphorbia* (species no. 14, 1752). He gave in both places a reference to van Royen ("Roy. Lugdb. 199"), and stated "*Habitat in Campechia. Houstoun!*." He included no further description, nor did he cite any manuscript from Houstoun, though such a manuscript had been mentioned by van Royen in his *Florae Leydensis Prodromus* of 1740, a work to which Linnaeus contributed.

No specimen of *E. ocymoidea* has been recorded from any Linnaean herbarium, as far as I am aware, and apparently none exists in van Royen's herbarium in Leiden, as Dr. J. F. Veldkamp kindly informs me. The only Houstoun specimen that I have been able to locate is one at the British Museum (BM), apparently the specimen cited by Boissier (in DC. Prodr. 15, part 2: 57, 1862) as "Houston in h. Banks!" It appears to have been taken from a plant cultivated by Philip Miller at the Chelsea Physick Garden. It bears a label in Houstoun's hand, "Tithymalus americanus, annuus erectus, ramosissimus, ocymi caryophyllati foliis. C Mss." and the further inscription "ex H[ort.?] Ch[elsea ?].: 1732." There is no evidence that Linnaeus ever saw the specimen. The herbage is copiously glandular, as in other specimens referred here to the var. *ocymoidea*, and the glandular appendages are cleft into narrow but not filiform divisions, as in many other specimens from Yucatán and elsewhere in eastern Mexico. Taxonomically I should refer it without question to the var. *ocymoidea* as differentiated in the key above.

If Linnaeus ever saw a specimen of *E. ocymoidea*, as explained below, it seems most likely that it was a duplicate of the one at BM, i.e., one presented to him by Miller, taken from a cultivated plant. In this case the specimen at BM is arguably an isotype and could be designated as lectotype. Whatever the case, there can be hardly any doubt that the Linnaean name derives directly from a plant of this particular gathering by Houstoun. In the absence of proof of the existence of a holotype, the specimen at BM is hereby designated as **neotype** of *Euphorbia ocymoidea* L.

Discussion: Philip Miller presented some of Houstoun's Central American and West Indian specimens, conceivably including a specimen of *Euphorbia ocymoidea*, to Linnaeus when the latter was in England in 1736 (Stearn, intr. to Ray Soc. ed. of Sp. Pl., 1957, p. 105). At the same time Miller gave to Linnaeus a series of Houstoun's unpublished notes (Staffleu & Cowan, Tax. Lit. ed. 2: 343, 1979). Linnaeus then returned to Holland, where among other things he worked with Adriaan van Royen during the preparation of the latter's *Prodromus*. That either Linnaeus or van Royen ever saw a specimen of *E. ocymoidea* remains conjectural, but it seems clear that both saw a Houstoun manuscript, as one was cited in 1740, in van Royen's *Prodromus*, in a paragraph following the specific character, as follows: "Tithymalus americanus annuus erectus ramosissimus, ocymi caryophyllati folio. *Houst. mss.*" Presumably the words "ocymi caryophyllati folio" were Linnaeus's inspiration for the epithet *ocymoidea*, and it will be noted that the reference to "*Houst. mss.*" exactly repeats the words, with slight variations in spelling and punctuation, that appear in Houstoun's hand on the specimen at the British Museum. It is still not clear to me how Linnaeus hit upon Campeche as the source of Houstoun's material, for the locality was not cited by van Royen, nor does the word appear on the specimen at BM. For assistance in locating and assessing the significance of the Houstoun specimen, for information about the inscriptions thereon, and ultimately for the loan of the specimen, I am much indebted to Dr. F. R. Barrie and to Dr. Roy Vickery.

***Euphorbia ocymoidea* var. *subreniformis*** (S. Wats.) McVaugh, comb. nov.  
*Euphorbia subreniformis* S. Wats. Proc. Amer. Acad. 21: 439. 1886.

***Euphorbia oppositifolia*** McVaugh, sp. nov. sect. *Agalomatis*, perennis, erecta, ca 45 cm alta, omnino glabra; caulis foliosus, apicem versus 3–5-furcatus, ramis oppositis divaricatis; folia infra furcas omnia opposita, paribus ca 15, internodiis 0.7–3 cm longis; stipulae ut videtur in protuberationem planam coalitae, inter foliorum pares sistentes; petioli tenuissimi 5–8 mm longi; laminae anguste obovatae vel ellipticae, integrae, 3–4 cm longae (infimae minores), 1–1.4 cm latae, basi subattenuatae lateribus congruentibus, apice obtusae apiculatae; nervus medius subtus prominens subtus; lamina in paginis ambabus marginibusque minute papillosa, venis lateralibus debilibus obscuris; inflorescentia bracteata, bracteis foliosis viridibus, folia caulinea simulantibus sed minoribus 5–15 mm longis, plerumque ellipticis vel anguste ovatis; cyathia solitaria, in ramorum furcas distales terminalia breviter pedunculata; involucrium campanulatum 1–1.2 mm longum; lobi inconspicui, ca 0.3 mm longi, basi virides, apice albi laciniati; glandulae 4 (–73), conspicuae, planae, transverse elongatae, 0.3–0.5 mm longae, 0.2 mm latae; appendices virides, sub anthesi recurvatae, 0.4–0.7 mm latae, marginibus rotundatis integris, ultra glandulam ca 0.25 mm extensis; flores ♂ ut videtur 10–12; styli sub anthesi ca 0.5 mm longi, subcapitati, ad medium bifidi; gynophorum 1.5–2.5 mm longum,



FIG. 2. *Euphorbia oppositifolia* (from the holotype). Habit,  $\times 0.5$ ; terminal leafy node with pedunculate cyathium,  $\times 15$ ; involucre laid open,  $\times 20$ ; ovary and styles,  $\times 20$ .

plerumque valde recurvatum; capsula submatura valde acuteque lobata, 1.9–2.2 mm longa, 3 mm lata; columella 1.3 mm longa; semina immatura ecarunculata, ovoidea, grosse foveata.

Fig. 2.

Known only from the holotype, a somewhat less than satisfactory specimen: Jal., Mpio. Puerto Vallarta, entre El Arroyo Verde y El Nogal, en una cañada, 850 m, in flower and immature fruit 7 Nov 1971 (*R. González T. 590*, MICH).



Stem ca 45 cm tall, near base ca 1.5 mm thick, smooth, hard, arising from what appears to have been a multinodal horizontal rhizome ca 2 mm thick, with thin brownish bark splitting in irregular interconnected longitudinal fissures; leaves all opposite, ca 15 pairs, present at all but 3 of the lowermost cauline nodes; lower internodes 7–10 mm long, the upper 8 internodes 2–3 cm long; at each node, exactly between the bases of the petioles on opposite sides of the stem, are a pair of flattened hard triangular processes that I interpret as being stipular remains; petioles very slender, 5–8 mm long; blades entire, membranous, narrowly obovate or elliptic, all except the smaller lowest ones 3–4 cm long, 1–1.4 cm wide, subattenuate and bilaterally symmetrical at base, obtuse and apiculate at apex; mid-nerve prominent beneath, the lateral veins weak, obscure; blades minutely papillose at margins and on both surfaces; stem forking about 3–5 times in the apical 15 cm, the branches very slender, the cyathia few, terminal in the ultimate forks, on peduncles ca 1 mm long, subtended by broad green leafy bracts 5–10 (–15) mm long; involucre campanulate, 1–1.2 mm long; lobes inconspicuous, ca 0.3 mm long, green at base, whitish and lacinate at apex; glands 4 (?–3), conspicuous, transversely elongate, 0.3–0.5 mm long, 0.2 mm wide (high), somewhat flaring from the summit of the involucre, large in proportion to the appendages, flattened to the base of the appendage but raised platelike above the surface; appendages recurving from the involucre, a strong green when dry (sometimes darker than the leaves), apparently fleshy, roundish, entire, 0.4–0.7 mm wide, longer than the lobes of the involucre, but surpassing the gland proper by only ca 0.25 mm, little more than the width of the latter; ♂ flowers apparently 10–12; styles at anthesis ca 0.5 mm long, subcapitate, bifid ca one-half their length; gynophore 1.5–2.5 mm long, usually strongly recurved; capsule (somewhat immature) strongly and acutely lobed, 1.9–2.2 mm long, 3 mm wide; columella 1.3 mm long; seeds ecarunculate, when immature but nearly full size suggesting those of *Euphorbia graminea*, ovoid, with several longitudinal rows of shallow isodiametric depressions.

To base a description of a species on a single specimen without fully mature fruit or seeds is ordinarily to be avoided, and the description itself must be accepted as a provisional one. This is an extraordinary species, differing in a number of respects from any other Mexican or Central American species known to me. The combination of an erect, completely glabrous perennial with a hard and perhaps woody but still slender stem, numerous pairs of small opposite papillose bilaterally symmetrical leaves, green foliaceous floral bracts, four glands with short green appendages hardly twice as long as the width of the proportionately large glands, but still longer than the inconspicuous lobes of the involucre, and a small number of staminate flowers, appears to be unique. In habit the plant suggests some herbaceous species of *Phyllanthus*, under which name it was found in the herbarium.

***Euphorbia schlechtendalii*** Boiss. Cent. Euph. 18. 1860; DC. Prodr. 15, part 2: 60. 1862. *Alectoroctonum ovatum* Schlecht. Linnaea 19: 252. 1846, not *Euphorbia ovata* E. Mey., 1843.

The name *Alectoroctonum* was proposed by Schlechtendal for a group of species now generally referred to *Euphorbia*, mostly woody plants with verticillate leaves and brittle nodes, widely distributed in Mexico and Central America. Standley (1923) admitted to the flora of Mexico about ten species of this complex, including *Euphorbia schlechtendalii*, which was distinguished from all the others (except for *E. peganoides*, which has linear leaves) in having the involucre glabrous and the appendages “nearly obsolete.” Standley gave the range of *E. schlechtendalii* as “Tamaulipas to Sinaloa, Oaxaca and Yucatán,” Guatemala, and Nicaragua;

that is to say, more or less throughout central and southern Mexico including Nueva Galicia.

It requires little more than a cursory survey to show that *E. schlechtendalii* is neither a homogeneous population, nor is it continuously distributed across Mexico from east to west. Like the other woody Mexican Euphorbias with verticillate leaves, it seems to find its best expression in the humid mountains facing the oceans both to the east and to the west. *Euphorbia schlechtendalii* itself seems to range almost continuously southeastward along the Pacific slope from Sinaloa to the Isthmus of Tehuantepec and beyond, and from the isthmus northward along the Atlantic slope to Tamaulipas. Within this range certain regional differences are manifest. Whether or not such regional variants are to be considered as mere curiosities, as named infra-specific taxa, or as distinct species, is almost always a subjective matter depending upon personal judgment. In this instance I believe it is reasonable to refer most of the individuals with glabrous involucre, throughout the range, to an inclusive *E. schlechtendalii*, with the possible exception of those constituting *Euphorbia macvaughii*, which was segregated in 1981.

In most specimens of what has been called *Euphorbia schlechtendalii* the branchlets, at first green, turn a rich reddish brown by the end of the growing season. Woody branchlets of one or more years of age, on drying, tend to shrink and become fluted, like some architectural columns, with longitudinal rounded grooves alternating with narrow acute ridges. The grooves tend to be irregular and anastomosing, but characteristic. The surfaces are not wrinkled between the ridges. At the nodes, and on older twigs, the surfaces often split or crack, with resultant loosening of a paper-thin red outer layer.

In some local variants, as in *E. macvaughii*, the older branches exfoliate in thin lustrous coppery-red papery layers, as in the genus *Bursera*, sect. *Bursera*.

The only major departure from the above, as far as noted, is in a population inhabiting the humid mountains of the Pacific slope, at elevations from about 1400 to 2600 meters. In this, apparently the most common representative of the species in Nueva Galicia, the woody twigs older than those of the current season remain terete in drying; the outer bark is gray to beige or pale reddish, not fluted but finely longitudinally wrinkled, usually not cracking longitudinally (as if stretched), and not exfoliating.

Among the specimens with dark red fluted twigs, I cannot always reliably distinguish those native to the Atlantic slope of Mexico (the type-region of *E. schlechtendalii*) from specimens with similar twigs from the Pacific slope at moderately low elevations (sea-level to 600 meters). Other features, however, tend to be concentrated in one region or the other, leading me to put forth the following scheme including *E. schlechtendalii* and its closest relatives:

1. Woody twigs (older than those of the current season) drying terete, the outer bark gray to beige or pale reddish, smooth or finely and sharply longitudinally wrinkled, usually not cracking longitudinally (as if stretched) nor exfoliating; leaves persistent more or less throughout the year, the inflorescences developing at the tips of branches when the leaves are full grown or nearly so; cyathia commonly numerous (up to 50 or more) in terminal umbelliform clusters; bracts subtending the cyathia scarious, subulate, deciduous from a prominent persistent base before the cyathia are fully developed; humid montane forests, 1400–2600 m.  
*E. schlechtendalii* var. *pacifica*.
1. Woody twigs in drying commonly fluted or angled, usually with strong acute ribs and broad concave furrows, dark reddish brown, the thin outer layers of bark (after the first year) often splitting longitudinally as if stretched, later often cracking and loosening near nodes,

in some populations readily exfoliating in thin coppery-red sheets; leaves persistent or deciduous, the plants often flowering when leafless; cyathia often fewer, sometimes numerous, the bracts quickly deciduous or persistent and leafy; plants of lower elevations, sea-level to 1200 (-1850) m.

2. Inflorescences developing on leafless branches, or with and slightly before the new leaves; bracts subtending the nodes of the cymes mostly caducous, or partly or wholly persistent and foliaceous; bark of the trunk and larger branches coppery red, conspicuously exfoliating; leaf-blades elliptic-ovate to obovate, broad at apex, often broadly cuneate at base, mostly 2-3 cm long and (0.9-) 1.2-1.8 times as long as wide.

3. Flowering as the new leaves develop, or seldom on leafless branches; bracts subtending the nodes of the cymes often partly foliaceous and persistent, partly scarious, subulate, caducous; gynophore 1-1.5 mm long, the capsule never fully exerted from the cyathium; mostly inner valleys, sometimes on limestone, Jal., Col., 750-1850 m.

*E. macvaughii* Carvajal & I. R. Lomeli.

3. Flowering on leafless branches, rarely with developing leaves; bracts subtending the nodes of the cymes mostly scarious, subulate, caducous; gynophore 5-6 mm long, the capsule evidently exerted; valleys of the Pacific slope, 650-1500 m, Nay., Jal., Mich., Gro., Mor.

*E. macvaughii* (var. ?).

2. Inflorescences developing on leafy branches after the leaves are fully grown, or shortly before that; bracts subtending the nodes of the cymes often all foliaceous (sometimes very small), and persistent; bark of the trunk and larger branches not conspicuously exfoliating as far as known; leaf-blades prevailingly ovate-triangular, widest at base, strongly narrowed to an acute (sometimes blunt) tip, 2-4.5 (-6.5) cm long, mostly 1.5-1.8 (-2.25) times as long as wide; capsule manifestly exerted.

4. Cyathia mostly few-10, rarely to 30, in divaricately forking assemblages with a strong central peduncle, and most of the nodes leafy-bracted; moderately dry deciduous forests, sea-level to 600 m on the Pacific slope.

*E. schlechtendalii* var. *websteri*.

4. Cyathia in leafy-bracted cymes, or the branches elongating, more irregularly branched, only a few bracts leafy; 200-400 m as far as known, Atlantic slope, Tamaulipas to Veracruz.

*E. schlechtendalii* var. *schlechtendalii*.

***Euphorbia schlechtendalii* var. *pacifica* McVaugh, var. nov., a var. *schlechtendalii* et a var. *websteri* differt:** Ramulis in siccitate teretibus, viridi-griseis, pallide rubellis vel pallide brunneolis, nec angulatis nec striatis canaliculatisque fusco-rufis; cyathiis saepe numerosis, usque ad ca 50 in fasciculis terminalibus paniculiformibus vel umbelliformibus aggregatis; cymarum bracteis nec foliaceis nec persistentibus, sed eorum apicibus scariosis subulatis mox deciduis; habitat in temperatis humidis Mexici occidentalis locis. A var. *websteri* foliis plerumque elliptico-ovatis non triangulari-ovatis facile distinguitur.

Fig. 3.

Mexico, common in western Jalisco (Sierra de Manantlán, along a stream, N slopes ca 24 km by road S of El Chante, near Rancho Manantlán, *McVaugh 23070*, MICH, the holotype) and western Michoacán, on mountainsides and in humid *barrancas* in pine or pine-fir forest or forest of mixed coniferous and deciduous trees, at elevations from 1400 to 2600 m, flowering November to March.

SPECIMENS EXAMINED (all at MICH except as noted): Jal., Mpio. San Sebastián [del Oeste] (*Mexia 1441*, US; Segundo Arroyo, *Mexia 1544*, GH, MICH, US); San Sebastián to Bufo de Mascota (*Nelson 4099*, GH, US); Mpio. Talpa de Allende (SW of Talpa, Sierra de Cuale SW of the peak called Piedra Rajada, *McVaugh 14365*; "10-12 mi" S of Talpa, above Los Sauces, headwaters of east branch of Río de Talpa, *McVaugh 21470*); near Santa Mónica, ca 20° N, 104° 30' W (*McVaugh 14055*); Mpio. Autlán, Sierra de Cacoma, 1500 m (*Limón & Puga 11712*, WIS); Mpio. Autlán, Sierra de Manantlán, Las Joyas (*Vázquez 3810, 3894*, ZEA, reported by *Vázquez et al.* 1991, not seen); Sierra de Manantlán Occidental, La Calera (a ravine 9 km by air NNE of Casimiro Castillo) (*Iltis 31027*, MICH, WIS); SSE of Autlán, "4-10 mi" above Ahuacapán, road to Corralitos (*McVaugh & Koelz 940*); Sierra de Manantlán, seaward-facing slopes between Aserradero San Miguel Uno and

El Durazno, 2000 m (*McVaugh 13936*); Mpio. Tolimán, 3–4 km SSE of La Laguna, ca 39 km NW of Cd. Colima (*Cuevas & Nieves 2212*, WIS, ZEA); Mich., 15–16 km SE of Aserradero Dos Aguas, and nearly W of Aguililla, on limestone (*McVaugh 24738*).

This plant is common and conspicuous on the Sierra de Manantlán, as suggested by the numerous collections cited. As noted on the label of the holotype, it is probably the most common tree of the understory there, in barrancas and other humid areas. Two sterile specimens from arid regions near Apatzingán, Michoacán, *Leavenworth 1529, 1544*, both F!, reported under the name of *Euphorbia schlechtendalii* in Amer. Midl. Nat. 36: 177. 1946, probably belong not here but with var. *websteri*.

Shrubby or arborescent, glabrous, sometimes with whiplike stems 1–4 m high and up to 1 cm in diameter, but often a copiously branched tree up to 10 m high and trunk-diameter of 12–15 cm, with verticillate leaves and branches, the leaves 3–6 (–8) in a whorl; woody twigs (older than those of the current season) remaining terete in drying, the outer bark gray to beige or pale reddish, finely and sharply longitudinally wrinkled, usually not cracking longitudinally (as if stretched), not exfoliating; petioles disproportionately slender, up to 0.5 mm thick, those of the principal leaves (1–) 3–5 cm long, often longer than the blades; blades entire, commonly elliptic-ovate, narrowed (usually from below the middle) to a broad obtuse and often slightly retuse tip, acute to broadly rounded at base, 2.5–3.5 (–7) cm long, 1.5–2.5 (–4) cm wide, 1.5–2.5 times as long as wide, the thickened margins often decurrent on the inner angles of the petiole or seldom forming a continuous line across it and the blade then subpeltate; principal lateral nerves ca 8 (–12) on each side; stipules glanduliform, broadly subulate, 0.2–0.6 mm long; plants flowering when in full leaf; inflorescence seeming to be of sessile axillary or terminal clusters, each cluster actually of several short-peduncled densely aggregated dichasial or irregularly branched naked cymes (the small subulate bracts soon deciduous above a conspicuous persistent base); peduncles 1.5–3.5 (–6) mm long; cyathia up to 5 in each cymelet, and up to ca 50 in a terminal cluster, short-campanulate, rounded at base, 1.9–2.6 mm long excluding the glands; lobes membranous, whitish, erect and relatively conspicuous, incurved in the young cyathium, 1.3–1.5 mm long and wide, quadrate or flabellate, fringed at apex; glands 5, green (“dull salmon-green”), transversely elliptic, cupped, 1.2–2 mm long, 0.5–1 mm wide (high); appendages fleshy, crowded and somewhat overlapping, radially spreading, yellow-green, cream-colored or “greenish cream,” oriented and shaped like the glands but wider and longer, (1.3–) 2–2.5 mm wide, (0.3–) 0.7–1.5 mm long (high), entire or the margins sometimes sinuous or obscurely erose; ♂ flowers ca 20–35; styles ca 2 mm long, the basal column 0.6–0.8 mm long, the branches thick, ca 1.2–1.3 mm long, bifid one-half to two-thirds their length; gynophore (3–) 5–7 (–10) mm long, with prominent collar up to 1.5 mm wide; capsule (3.5–) 4.5–5 mm long, 5–6.5 mm wide, with 3 rounded lobes ca 3 mm in diameter; seed not seen mature, reported as 2.5 mm long (or as much as 3–3.5 mm), gray to dull brown, ovoid, truncate at base, 8–10-sided with 4–6 deeply concave pits on each face, the intervening ridges somewhat tuberculate and often paler.

***Euphorbia schlechtendalii* var. *schlechtendalii*.** *Alectorctonum ovatum* Schlecht., and *Euphorbia schlechtendalii*, as to type. Fig. 3.

Hillsides in moderately dry deciduous forest, often in calcareous or shaly soils, at low elevations on the Atlantic slope of Mexico and southward into Central America, flowering October to March. Reported from the states of Guerrero,

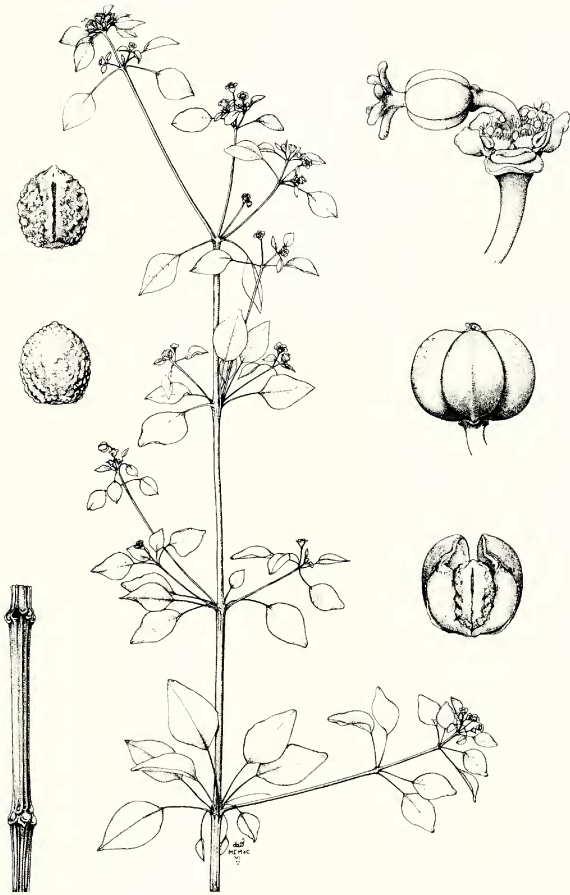


FIG. 3. *Euphorbia schlechtendalii*. Var. *websteri*, flowering branch,  $\times 0.5$  (from the holotype); seed, adaxial (upper) and abaxial views, and seed included in carpel after partial dehiscence, all  $\times 5$  (Webster & Breckon 16067, Colima). Var. *pacifica*, cyathium, lateral view,  $\times 5$ , and capsule just before dehiscence,  $\times 4$  (both from the holotype). Var. *schlechtendalii*, portion of flowering branch,  $\times 1$ , showing manner of shrinking upon drying (M. C. Johnston 5235, Tamaulipas).

México, Puebla, Veracruz (sylvis prope Actopan et sepibus Papantlae Mexici, *Schiede* in Jan and Mar 1829, the type; HAL!, the holotype), Hidalgo, Tamaulipas, and Yucatán and from Central America. What I take to represent the holotype, at HAL, which I have seen through the courtesy of the Curator, Klaus Werner, is mounted on two sheets. Sheet 71001, Bogen 1/2, bears a single copied label apparently partly in the hand of A. von Chamisso, and sheet 71001, Bogen 2/2, bears two original labels by Schiede, one for each locality. Each sheet includes several fragments both large and small, but as far as I can tell all the material on both sheets might have come from the same gathering.

Judging from the type-material, and from the limited amount of other material I have seen, the branchlets are indistinguishable from those of var. *websteri*; the leaf-blades tend to be rounded-ovate rather than triangular-ovate, mostly about 1.5–1.6 times as long as wide; the small bracts subtending the small cymes (that is, beyond the ultimate leafy cauline node from which the major cymes arise) are occasionally leafy and persistent, but never, as far as known to me, so consistently so as in var. *websteri*.

***Euphorbia schlechtendalii* var. *websteri* McVaugh, var. nov., frutex vel arbor glabra, var. *schlechtendalii* similis ramulis fusco-rufis, in siccitate angulatis vel striatis canaliculatisque, ramorum truncique cortice non desquamanti; sed foliorum laminis ovato-triangularibus vix elliptico-ovatis, apice plerumque acutis vel subacutis, inflorescentiae bracteis foliaceis, persistentibus differt; cyathiis paucis, fasciculo 5–15 (raro –30) aggregatis; glandium appendicibus plerumque integris, nonnunquam erosis; stylis subdistinctis vel in columna 0.2–0.6 mm longa coactis; habitat in calidioribus Mexici occidentalibus locis.** Fig. 3.

Tropical deciduous forest with *Bursera*, *Acacia*, *Amphipterygium*, *Cordia*, *Senna*, sometimes with *Brosimum* or *Cephalocereus*, sometimes in transition from grassland to oak savannah, or on ocean bluffs, sometimes on limestone, from sea-level to 600 m in the Pacific lowlands and foothills of Mexico, flowering October to March.

Sinaloa, ?Nayarit, Jalisco (near Los Arcos, ca "2.5 mi" S of Río de Cuale in Puerto Vallarta, *Webster & Breckon 15785b*, MICH, the holotype; *15785a*, WIS, isotype), Colima.

SPECIMENS EXAMINED (all at MICH except as noted): Sin., Mpio. Elota, NW of Elota, ca 24° N (*Webster & Breckon 15650*); Jal., seashore 2 km S of Puerto Vallarta (*Rzedowski 17739*); Mpio. La Huerta, Rancho El Paraíso, Chamela, rocky point above the shore (*Lott 645*); Mpio. La Huerta, vicinity of the Estación de Biología, Chamela (*Lott 1592*, reported by Lott [1986] as *E. schlechtendalii*, not seen); Mpio. Cihuatlán, along the old (1951) road to Tequezquiltán, "15 road miles" N of Barra de Navidad (*McVaugh 18888*): "8 mi" SW of Pihuamo, on limestone, with *Brosimum* (*McVaugh & Koelz 1499*); Col., "14 mi" WNW of Santiago, road to Cihuatlán, Jal. (*McVaugh 20773*); near Manzanillo (*Lott 855*, *Webster & Breckon 16067*); Mpio. Colima, 5.5 km SW of Los Asmoles, Colima–Manzanillo highway (*Lott 353*); mountain summits ca 15–20 km SSW of Colima (*McVaugh & Koelz 1591*, *McVaugh 26199*).

Glabrous, mostly described as a shrub 0.5–2 (–3) m high, sometimes as scandent, or a "vine-like shrub 6 m long, 2 cm in diameter at base," often as treelike, or as a small slender tree 2–6 m high, 2–3 cm in diameter at base; resembling var. *pacifica* and often identified as such, but differing as follows: plants seemingly smaller on the average, more slender, and more sparingly branched; branchlets (after the first year) dark reddish brown, when dry fluted or angled, usually with

prominent acute ribs and round-bottomed furrows, the thin outer layers of bark often splitting longitudinally into interrupted or interlocking strips, later cracking and loosening near the nodes, but not reported as exfoliating from the large branches and trunk; petioles 1–2.5 (–4.5) cm long, commonly shorter than the blades; blades prevailing ovate-triangular, broadest at base, acute at tip or sometimes (especially near the tips of the branchlets) ovate with broad obtuse tip, broadly rounded to obtusely angled at base, 2–4.5 (–6.5) cm long, 1.5–2.7 (–4) cm wide, mostly 1.5–2.25 times as long as wide; margins seldom decurrent at the base of the blade, sometimes meeting at the base on the adaxial surface; plants flowering when in full or nearly full leaf; cymes more leafy and with fewer cyathia than in var. *pacifica*, the number of cyathia in a cluster ca 5–15 (–30); bracts subtending the cyathia foliaceous but sometimes very small, shaped like the leaves or some of them elliptic, petiolate, persistent, the blades 1–5 mm wide; peduncles of the central cyathia of a dichasium up to 8 mm long; appendages 1.3–1.5 (–2.2) mm wide, 0.7–1 mm long (high), scarcely exceeding the glands or much larger, usually entire-margined, sometimes crose; styles essentially free to the base, or joined into a column 0.2–0.6 mm long, the branches ca 1–1.3 mm long, bifid two-thirds their length or a little less; gynophore 5–9 mm long; columella clavate, winged at apex, 2.6–3.3 mm long; seeds gray to nearly black, ovoid to subglobose, scarcely angled, truncate at base, 2.5–2.7 mm long, 2.5 mm in diameter, pitted on all surfaces, bearing adaxially a strong dark line.

What appears to be a variety or a close relative of *Euphorbia schlechtendalii* is ***Euphorbia nelsonii*** Millsp. (Bot. Gaz. 26: 268. fig. 1898, the type from María Madre Island, *Nelson 4284*, May 1897, US, the holotype, not seen). Other collections from María Madre and from Isla Isabel suggest that *E. nelsonii* may be a somewhat modified insular representative of the complex, resembling var. *websteri* with respect to the inflorescence but the leafy bracts fewer and less conspicuous, and the blades of the cauline leaves consistently orbicular-ovate or orbicular-obovate, 5–15 (–20, according to Millspaugh) mm long and 5–10 (–14.5) mm wide, on very slender (almost capillary) petioles usually longer than the blades (up to twice as long). The cyathia and the floral parts are generally smaller than in var. *websteri*; the columella is only about 2 mm long, and the seeds 1.8–2 mm long. The branchlets in drying become fluted, grayish red instead of dark red, and Mrs. Ferris noted that the “bark [is] gray, peeling off in thin strips as in fruit trees.” A sample of the bark preserved with *Ferris 5609* indicates that the strips tend to peel off transversely, as in such fruit trees as peaches, cherries, and plums. I should refer the following to *E. nelsonii*:

Nay., Islas Tres Marías, María Madre (*Maltby 130, 144*, May 1897, both US); María Madre (*Ferris 5609*, Oct 1925, US); Isla Isabel (*J. T. Howell 10532*, Jul 1932, US; *C. Davidson 2066*, Apr 1973, MICH).

***Euphorbia tenuissima*** M. E. Jones, Extr. from Contr. West. Bot. 18: 55. 1933.

Marcus Jones (*loc. cit.*) proposed two new species of *Euphorbia*, *E. longepetiolata* with cited type *Jones 27514a*, and *E. tenuissima* with cited type *Jones 27514*, both from “La Barranca, Guadalajara.” As noted by L. C. Wheeler (1945, p. 108) the published data do not agree with those on the specimens in Jones’ herbarium at POM. The specimen that bears the name *longepetiolata* and is the plant so described by Jones [i.e., *E. graminea* var. *graminea* in the sense of this paper], is numbered 27514. The material that Jones described as *E. tenuissima* is mounted

with a label for No. 27538, a number that Jones cited under *longepetiolata*. There is no specimen bearing the number 27514a. Wheeler designated as "type," i.e., holotype, *Jones 27538*, POM. He stated that in his opinion the species was closest to *Euphorbia subcaerulea* Rob. & Greenm.

What Wheeler did not mention, and presumably did not notice, is that the material mounted on the type sheet includes adequate and entirely identifiable specimens of three quite different species. The description by Jones, in the protologue, emphasized especially the habit and small leaves of one species, the glandular appendages of a second, and the seeds of the third. The mounted specimens include 1) two plants of *Euphorbia delicatula* Boiss., a larger and a smaller flowering plant, both with roots; 2) one incomplete plant of *E. graminea* Jacq. var. *graminea*, with a root but with only a few flowering branches from midstem or below; and 3) a few detached leaves apparently belonging to *E. ocymoidea* L. The packet mounted on the sheet contains several fragments 2-5 cm long, with leaves and fertile cyathia, of *E. ocymoidea* var. *subreniformis*. It also contains numerous seeds of *E. delicatula* and of *E. ocymoidea*, and a few of *E. graminea*.

Jones' description precludes the choice of the *ocymoidea* element as lectotype, although he alludes to the resemblance between that species and his *E. tenuissima*, and called the plant a "weak and erect and almost capillary annual, easily mistaken for *subreniformis*." Unfortunately he described the "flowers" as "very small, with very short and whitish appendages entire and rounded." He apparently noticed the appendages of the *graminea* element, which fit that description admirably, but not those of *E. delicatula*, which are thin and purplish and hardly to be characterized as "very short." Of the seeds he first said, "oblong and rounded at both ends, and a little flattened, but rounded on the corners, and shallow-pitted in vertical lines, not angled." That is exactly the seed of *E. delicatula*, except that he failed to note the conspicuous caruncle, which has indeed fallen from most of the seeds in the packet. At the end of the description he added, as if as an afterthought, "Seeds pectinately warty and pitted," a characterization that loosely fits either *graminea* or *ocymoidea*, the seed of the former however much larger than the other.

If the name *Euphorbia tenuissima* is to be typified at all, it seems that it must be on the *graminea* element or the *delicatula* element, Jones having disqualified *subreniformis* by his description of the appendages, which in *E. ocymoidea* var. *subreniformis* are greenish and deeply dissected into narrow segments. He described the appendages of *graminea* adequately, and may be said to have added a short description of the seeds, although that description applies equally well to the seeds of *E. ocymoidea*. He described the seeds of *delicatula* separately, and that very well indeed.

Wheeler, even though he seems to have noticed only the one species on the type-sheet, effected a kind of informal lectotypification by his reference to *Euphorbia subcaerulea*, a name that in the *Flora Novo-Galiciana* (ined.) is treated as a synonym of *E. delicatula*. Since the largest part of the material on the type sheet of *E. tenuissima* consists of two well-preserved flowering plants of *E. delicatula*, and a large number of the very characteristic seeds (including caruncle) of that species, formal action seems in order, and the lectotype is hereby designated as POM 191023, plants marked A<sup>1</sup> and A<sup>2</sup>. I am very grateful to the authorities at Rancho Santa Ana Botanic Garden for the loan of this and other specimens from POM.



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